

**FIFTH FIVE-YEAR REVIEW REPORT FOR
PMC GROUNDWATER SUPERFUND SITE
EMMET COUNTY, MICHIGAN**



Prepared by

**U.S. Environmental Protection Agency
Region 5
CHICAGO, ILLINOIS**

3/5/2025

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Table of Contents

LIST OF ABBREVIATIONS & ACRONYMS.....	2
I. INTRODUCTION	4
FIFTH FIVE-YEAR REVIEW SUMMARY FORM	5
II. RESPONSE ACTION SUMMARY	5
Basis for Taking Action	5
Response Actions	6
Status of Implementation	10
Institutional Controls	12
Post-Removal Site Control (PRSC) of existing SSDS	15
III. PROGRESS SINCE THE LAST REVIEW	16
OTHER FINDINGS.....	18
IV. FIVE-YEAR REVIEW PROCESS	19
Community Notification, Involvement & Site Interviews.....	19
Data Review	20
Site Inspection.....	21
V. TECHNICAL ASSESSMENT.....	21
QUESTION A: Is the remedy functioning as intended by the decision documents?	21
QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?	24
QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy?.....	25
VI. ISSUES/RECOMMENDATIONS.....	25
OTHER FINDINGS.....	28
VII. PROTECTIVENESS STATEMENT	28
VIII. NEXT REVIEW	29
APPENDIX A – REFERENCE LIST	30
APPENDIX B – FIGURES	31
APPENDIX C – TEMPORARY GSI CRITERIA LIST	34
APPENDIX D – PUBLIC AD	37
APPENDIX E – FYR INSPECTION REPORT	38

LIST OF ABBREVIATIONS & ACRONYMS

µg/L	micrograms per liter
µg/kg	micrograms per kilogram
µg/m ³	micrograms per cubic meter
ARAR	Applicable or Relevant and Appropriate Requirement
AS	Air Sparge
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COPC	Contaminants of Potential Concern
COC	Contaminants of Concern
DCE	cis-1,2-Dichloroethylene
EGLE	Michigan Department of Environment, Great Lakes, and Energy
EPA	United States Environmental Protection Agency
FS	Feasibility Study
FYR	Five-Year Review
GSI	Groundwater/Surface Water Interface
HFPO-DA	Hexafluoropropylene Oxide Dimer Acid
HHRA	Human Health Risk Assessment
ICs	Institutional Controls
ICIAP	IC Implementation and Assurance Plan
LTS	Long-term Stewardship
MCL	Maximum Contaminant Levels
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PCE	Tetrachlorethylene
PDI	Pre-design Investigation
PFAS	Per- and Polyfluoroalkyl Substances
PFBS	Perfluorobutanesulfonic Acid
PFHxS	Perfluorohexanesulfonic Acid
PFNA	Perfluorononanoic Acid
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctanesulfonic Acid
PMC	Petoskey Manufacturing Company
PRP	Potentially Responsible Party
PRSC	Post-Removal Site Control
RAO	Remedial Action Objectives
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
Site	PMC Groundwater Superfund Site

SSDSs	Subslab Depressurization Systems
SVE	Soil Vapor Extraction
TBC	To be considered
TCE	Trichloroethylene
USACE	US Army Corps of Engineers
UU/UE	Unlimited Use and Unrestricted Exposure
VC	Vinyl Chloride
VI	Vapor Intrusion
VIMS	Vapor Intrusion Mitigation System
VISL	Vapor Intrusion Screening Level
VOC	Volatile Organic Compounds
WSC	Water Street Condominiums

I. INTRODUCTION

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The United States Environmental Protection Agency (EPA) is preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP)(40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the fifth FYR for the PMC Groundwater Superfund Site. The triggering action for this statutory review is the signing of the previous FYR on March 5, 2020. The FYR has been prepared due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of one sitewide operable unit (OU) that will be addressed in this FYR.

The PMC Groundwater Superfund Site FYR was led by Cheryl Kondreck, EPA Remedial Project Manager (RPM). Participants included Amy Gahala, U.S. Geological Survey (USGS), hydrogeologist; Ruth Muhtsun, EPA Community Involvement Coordinator; and Beth Mead-O'Brien and Barb Vetort of the Michigan Department of Environment, Great Lakes, and Energy (EGLE). The State of Michigan was notified of the initiation of the FYR. The review began on 3/5/2024.

Site Background

The former Petoskey Manufacturing Company (PMC) facility was located at 200 West Lake Street, Petoskey, Emmet County, Michigan, and contained a die-casting plant from the 1940s and a painting operation from the mid- to late-1960s. The Site has been redeveloped as a condominium complex called the Water Street Condominiums (WSC) and is located approximately 500 feet south of Little Traverse Bay of Lake Michigan. It is bordered to the north by another condominium complex, to the east and south by residential structures, and to the west by the Bay Front Park access easement and a parking lot associated with a commercial structure. Additional single-family residential structures lie to the west and south. Bear River, which drains into Little Traverse Bay, is located approximately 500 feet east of the Site. Immediately south of Lake Street (behind a row of homes) is a steep bluff running approximately parallel to the shoreline (Appendix B, Figure 1).

Contamination at the Site was first discovered in September 1981 when drinking water samples were collected from the Ingalls Municipal Well. The samples from the Ingalls Municipal Well, when tested, showed high levels of trichloroethylene (TCE), cis-1,2-dichloroethylene (DCE), and trihalomethanes, and it was determined that the PMC facility was responsible for the contamination. Bad housekeeping and inappropriate disposal of spent solvents and/or paint sludge resulted in soil and groundwater contamination in the vicinity of the PMC facility.

FIFTH FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: PMC Groundwater Superfund Site		
EPA ID: MID006013049		
Region: 5	State: MI	City/County: Petoskey/Emmet
SITE STATUS		
NPL Status: Final		
Multiple OUs? No	Has the site achieved construction completion? Yes	
REVIEW STATUS		
Lead agency: EPA		
Author name (Federal or State Project Manager): Cheryl Kondreck		
Author affiliation: EPA Region 5		
Review period: 3/5/2024 - 10/25/2024		
Date of site inspection: 8/1/2024		
Type of review: Statutory		
Review number: 5		
Triggering action date: 3/5/2020		
Due date (five years after triggering action date): 3/5/2025		

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

Previous waste disposal practices were identified as the cause of soil and groundwater contamination at the Site and the basis for acting at the Site. Soil and groundwater contamination is also the source of vapor intrusion (VI).

The 1998 Record of Decision (ROD) did not specify contaminants of concern (COC), rather presented contaminants of potential concern (COPCs) for various volatile organic compounds (VOCs), semi-volatile organic compounds (SVOC), and metals in soils and groundwater based chemical-specific ARARs for the Sites (EPA 1998).

The human health risk assessment (HHRA) calculated total risk from all COPCs at the Site. Under the future residential use scenario, the HHRA calculated an unacceptable risk for ingestion and dermal contact of Site soils from the COPCs. Under the future residential risk scenario, the HHRA found unacceptable risk from groundwater ingestion from the Site COPCs. The HHRA did specifically

mentioned TCE, arsenic, manganese, and vinyl chloride (VC) as the main contributors to the risk from groundwater (Malcolm Pirnie 1998).

The main COC in vapor as stated in the 2022 Interim ROD is TCE (EPA 2022). Additional VOCs being monitored as part of the Interim ROD are tetrachlorethylene (PCE), benzene and ethylbenzene. TCE accounts for the majority of VOC mass in the Site’s soil and groundwater which has also contributed to the VI pathway at the Site.

The two primary exposure pathways identified by risk assessment are TCE in potential drinking water (EPA 1998) and inhalation of TCE via VI (EPA 2022).

No ecological risk assessment was performed for the Site. The PMC facility was in operation during the initial RI/FS and soil contamination is limited to the former PMC property (EPA 1998). The plume of contaminated groundwater discharges to Lake Michigan, but at levels not believed to pose any risk to ecological habitats (EPA 1998).

Response Actions

In 1982, under the direction of the State, PMC excavated contaminated soils at the Site, and the area was backfilled with clean compacted soil and graded to provide drainage. The soil was then covered with a synthetic liner and 6 inches of gravel. The Site was added to the National Priorities List on September 8, 1983.

In 1984, EPA negotiated a removal administrative order by consent with PMC to conduct hydrogeological studies (EPA 1984), and in 1987, EPA and PMC signed another administrative order by consent for PMC to conduct a full remedial investigation (RI)/feasibility study (FS) (EPA 1987). However, due to delays and financial uncertainty, EPA took over the RI/FS work from PMC in September 1990 (EPA 1990).

On June 14, 1995, EPA signed an Interim ROD to provide air stripping treatment of groundwater at the Ingalls Municipal Well (EPA 1995). However, in place of the air stripper on Ingalls Municipal Well, the State requested that the City’s construction of a new drinking water source be considered an enhancement of the selected remedy under 40 CFR 300.515(f). In late 1997, the City of Petoskey completed construction of its replacement municipal wells; use of the Ingalls Municipal Well ceased, and it was abandoned and removed in 2006.

On September 30, 1998, EPA issued a final ROD to select the remedies for soil and groundwater at the Site. Table 1 summarizes the remedial action objectives (RAOs) and remedy decisions for the 1998 ROD (EPA 1998).

Table 1: Summary of RAOs and Remedy Selected in the 1998 ROD

RAOs	Remedy Requirements
Prevent direct contact with or ingestion of soil under current industrial and future residential land-use scenarios	<ul style="list-style-type: none"> Deed restrictions in accordance with Michigan Natural Resources and Environmental Protection Act Part 201 due care requirements for the landowner’s responsibilities if the current structure of PMC property is partially or totally removed. The deed restriction will also require (if soils

<p>(to the extent necessary based on risk assessment results and chemical-specific Applicable or Relevant and Appropriate Requirements).</p>	<p>under the building are uncovered) the property owner to determine if there is a threat to human health and the environment and/or exceedances of the State’s chemical-specific Applicable or Relevant and Appropriate Requirements (ARARs), conduct any follow-up action (i.e., additional investigation and disposal) necessary for any development of the property, and not to exacerbate an existing condition.</p> <ul style="list-style-type: none"> Excavation and offsite disposal of approximately 15 cubic yards of contaminated soil that exceed EGLE’s residential direct contact criteria.
<p>Protect future exposure to groundwater containing site-related contamination at concentrations exceeding Maximum Contamination Levels.</p>	<ul style="list-style-type: none"> Deed restrictions to prohibit the future use of the groundwater for private property because the current municipal ordinance may be insufficient to prohibit the construction of wells and use of groundwater.
<p>Restore the aquifer to its highest beneficial use (i.e., drinking water).</p>	<ul style="list-style-type: none"> Excavation and offsite disposal of approximately 15 cubic yards of contaminated soil that exceed EGLE’s residential direct contact criteria and groundwater/surface water interface (GSI) protection criteria for protection of surface water. Operation of a soil vapor extraction (SVE) system to remove TCE from deep, unsaturated soils. Use of a natural attenuation and monitoring program to address groundwater contamination to restore the most beneficial use of the aquifer. Installation of additional groundwater monitoring wells in the area between the former PMC facility and Lake Michigan and monitoring of groundwater contaminant levels until compliance with Maximum Contaminant Levels (federal drinking water criteria) (MCLs) and EGLE’s GSI criteria are achieved. A Contingency Plan would be implemented in the event that natural attenuation is not occurring sufficiently or at an acceptable rate.
<p>Protect surface water from site-related contaminants in groundwater in accordance with provisions set forth in Part 201 of the Michigan Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, and Part 31 and associated rules.</p>	<ul style="list-style-type: none"> Use of a natural attenuation and monitoring program for groundwater contamination for the most beneficial use of the aquifer. Installation of additional groundwater monitoring wells in the area between the former PMC facility and Lake Michigan, and monitoring of groundwater contaminant levels until compliance with MCLs and EGLE’s GSI criteria is achieved. Deed restrictions in accordance with Michigan Natural Resources and Environmental Protection Act Part 201 due care requirements for the landowner’s responsibilities if the current structure of PMC property is partially or totally removed. The deed restriction will also require (if soils under the building are uncovered) the property owner to determine if there is a threat to human health and the environment and/or exceedances of Michigan’s chemical-specific ARARs, conduct any follow-up action (i.e., additional investigation and disposal) necessary for any development of the property, and not to exacerbate an existing condition.

The 1998 ROD noted that Michigan's Generic Soil Criteria Protective of Groundwater Surface Water Interface (GSI) and Michigan's Generic GSI Criteria were in the process of being updated at the time of the issuance of the ROD (EPA 1998, page 33). Therefore, the specific identification of exceedances of generic groundwater and soil criteria (related to the GSI) were not completed prior to the issuance of this ROD (EPA 1998, page 33). The ROD provided the most recent list of available generic GSI criteria for soil and groundwater and is included in Appendix C. The ROD further explains the list of contaminants in Appendix C are the "controlling GSI criteria until such time as the site-specific values can be calculated for the Petoskey site. These temporary criteria were based on discharge to a drinking water source, but the list does not contain criteria for all contaminants of concern at the Petoskey site." (EPA 1998, page 33).

The final list of COCs at the Site for the 1998 ROD have not been developed and a temporary partial list based on EGLE's Generic GSI criteria from the 1998 ROD is presented in Appendix C (EPA 1998). However, based on the RAOs above, the cleanup goals for the Site would be the more conservative (lower concentration) of the MCLs and GSI criteria for groundwater and the more conservative (lower concentration) of EGLE's GSI Protection Criteria and Groundwater Protection for Residential Drinking Water for soils. Site-specific GSI criteria will need to be developed for the Site in consultation with EGLE. This site-specific GSI criteria will be used to develop the soil criteria for the GSI Protection Criteria. The contaminants specifically listed in the HHRA are presented in Table 2 below as reference for subsequent sections of this FYR (Malcolm Pirnie 1998).

Table 2: Groundwater and Soil Criteria based on RAOs and HHRA

Groundwater			
Contaminant	MCL (µg/L)	EGLE generic GSI (µg/L)	Temporary Criteria (µg/L)
TCE	5	200	5
VC	2	13	2
Manganese ¹	NC	1,300	1,300
Arsenic ¹	10	10	10
Soils			
Contaminant	Direct Contact (µg/kg)	EGLE Criteria (µg/kg) ²	Temporary Criteria (µg/kg)
TCE	110,000	100	100
Zinc	170,000,000	16,000	16,000

Notes:

1 = Contaminant identified as risk to groundwater ingestion, but background study needed to confirm these are from the Site.

2 = Value presented for TCE is the Residential Drinking Water Protection Criteria and the value presented for Zinc is the Generic GSI Protection criteria but will need to be updated. An updated list of site-specific criteria will be developed in the future not only for zinc but other COPCs.

µg/L = micrograms per liter

µg/kg = micrograms per kilogram

In 2016, EPA began a VI investigation at the redeveloped WSC (former PMC facility) and found high levels of contamination, primarily TCE in the indoor air. Subsequently, the EPA's Removal Program installed vapor intrusion mitigation systems (VIMS) in 2016-2017. These subslab depressurization systems (SSDs) were installed in 11 condominium units at WSC and one commercial building to the

west of WSC to prevent TCE from entering into these buildings. These initial response activities were completed in April 2018. Six additional condominiums and three single family homes were recommended for preemptive mitigation. At these units and buildings, the indoor air results did not exceed EPA’s standard for TCE in indoor air (i.e., no current risk to human health) however soil gas sampling indicated possible future risk.

A Phase II Removal Action was initiated on September 27, 2019, to pre-emptively mitigate the six condominium units because they were located directly above the source materials. The systems were installed in 2020 however, the final efficacy sampling of the SSDS was delayed until April 2022 due to the COVID-19 pandemic. The Removal Action was completed in June 2022. An assessment to pre-emptively install SSDSs at the three single family homes near the condominium properties, where there were no indoor air exceedances, was completed by the Removal Program which concluded that standard SSDSs could not be installed due to how the homes were constructed. It was determined that a more extensive system would be needed on these buildings and would be addressed in an amended decision document for the Site.

On September 27, 2022, EPA issued an Interim ROD to select the remedy for the source of the VI (soils and groundwater at the source area) and for pre-emptive mitigation of any buildings in the Study Area that may pose a future risk to human health from VI. Table 3 summarizes the RAOs and remedy decisions for the 2022 Interim ROD.

Table 3: Summary of RAOs and Remedy Selected in the 2022 Interim ROD

RAOs	Remedy Requirements
<p>Reduce the mass of TCE and other potential COCs in soil and groundwater under the former PMC property acting as ongoing sources for exposure to humans via inhalation until the mass recovered reaches asymptotic conditions or until soil vapor, groundwater, and indoor air all reach the cleanup goals based on an estimated lifetime cancer risk of 10^{-5} and noncancer hazard quotient of 1.</p>	<ul style="list-style-type: none"> • Installation of horizontal air sparge (AS) and SVE segmented wells for source control. • Installation of vertical wells as needed based on the remedial design (RD). • Installation of the AS/SVE system components. • Operation of the AS/SVE until source control RAO is achieved. • Management of investigative-derived waste and waste streams • Monitoring environmental media (groundwater, soil vapor, indoor air, and sewer gas) to evaluate the impact of the selected remedial action and to ensure vapors are not migrating into uncaptured areas. • Air permit-required sampling and associated reporting. • Institutional and engineering controls (such as signs, fencing, etc.) necessary to protect public safety during construction and, if applicable, operation of the remedy. • A pre-design investigation with the objective of characterizing the source area in finer details to provide information necessary for designing the source reduction system (AS/SVE). This investigation is anticipated to include soil, soil vapor, and groundwater sampling, monitoring well installation and sampling, and analyses (for VOCs and other parameters such as grain size), and alternative-specific analyses.
<p>Mitigate vapor in buildings within the Study Area that pose an unacceptable current and future risk to</p>	<ul style="list-style-type: none"> • Additional investigation to determine if VIMS are needed outside of the source area to mitigate vapor intrusion based on multiple lines of evidence. There are buildings that were never sampled for vapor intrusion due to lack of access and other buildings that need further assessment.

<p>human health via inhalation at an estimated lifetime cancer risk of 10^{-5} and noncancer hazard quotient of 1 based on multiple lines of evidence.</p>	<p>Preemptive mitigation will be conducted to ensure health and safety of the building occupants based on subslab and soil vapor sampling results. Some buildings will not allow for the traditional SSDSs to be installed due to the building construction and safety. Therefore, building specific information will need to be gathered during the pre-design investigation to engineer the safest and most optimal system to mitigate vapor intrusion.</p> <ul style="list-style-type: none"> • Installation of VIMS based on sampling data and building-specific needs.
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Interim cleanup goals are used in the Interim ROD for determining when VIMS are necessary at a building and for comparison purposes for the source reduction RAO. The final cleanup levels for the Site will be memorialized in the future final amended ROD for the PMC Site. The Interim ROD COCs and cleanup goals are presented below in Table 4.

Table 4: Groundwater, Vapor, and Indoor Air Interim Cleanup Goals¹ under the 2022 Interim ROD

Media	Groundwater ² to vapor, µg/L	Soil Gas		Indoor Air ³ , µg/m ³
		Near/Subslab Soil Gas, µg/m ³ (full concrete slab present, slab-on-grade or basement)	Dirt Floor Soil Gas, µg/m ³ (dirt floor, no concrete slab or beneath a partial basement slab)	
COC				
TCE	1	70	7	2.1
Potential COCs				
Benzene	3.2	120	12	3.6
Ethylbenzene	8.5	374	37.4	11.2
PCE	13.2	1,390	139	41.7

Notes:

1. Cleanup Goals were calculated based on the EPA vapor intrusion screening level (VISL) calculator for indoor air and Site-specific attenuation factors (the attenuation factor for groundwater is 1×10^{-2} ; the attenuation factor for soil gas for homes with dirt floor is 0.3 and is 0.03 for near/subslab soil gas).
2. Groundwater to vapor Cleanup Goals were calculated based on VISL for indoor air and Site-specific groundwater attenuation factor of 1×10^{-2} at a temperature of 9.5°C
3. Indoor air Cleanup Goal was determined using the EPA VISL calculator (EPA 2022) using a hazard quotient of 1.0 and target risk of 1×10^{-5} .

µg/L = micrograms per liter

µg/m³ = micrograms per cubic meter

Status of Implementation

1998 ROD Implementation:

The remedial action construction activities began after EPA approval of the remedial design work plan in October 1999. The construction work was separated into a soil excavation unit and SVE unit:

- **Soil Excavation:** Excavation of approximately 2,500 cubic yards contaminated soil began on November 1, 1999. Soil was excavated from the northern portion of the Site to a depth of up to 15 feet below ground surface; deeper contaminated soil was left in place. The excavated soil was transported and disposed in a nonhazardous waste landfill. All disturbed areas were backfilled with clean soil and seeded or covered with gravel consistent with the original conditions.

- Soil Vapor Extraction: The SVE system installation was completed in November 1999 and was operated over three time periods until discontinued and dismantled on December 27, 2000. As specified in the construction quality assurance plan, the SVE system was operated until the organic vapor concentrations were less than 0.1 part per million by volume for three consecutive weeks in soil vapor samples collected from all soil vapor probes. Approximately 753 grams of TCE were removed from the subsurface by the SVE system during the three treatment periods.
- Monitored Natural Attenuation of the Groundwater: This included the development of a groundwater monitoring plan followed by long-term monitoring.
- Establishment of Deed Restrictions: As shown in Table 5 below, some institutional controls (ICs) have been implemented on the Site.

On February 18, 2000, a Preliminary Close-Out Report was signed (EPA 2000). This document indicated that the remedial construction activities had been completed at the Site.

In 2000, the State awarded the City of Petoskey \$600,000 to acquire and demolish the former PMC facility. In April 2003, the former PMC facility was sold through Chapter 7 Bankruptcy Trustee to Perazza Products, LLC, a Michigan corporation (the developer). The Site was redeveloped under a City Brownfields Redevelopment Authority and a Small Business Tax Credit from the Michigan Economic Development Corporation. In July 2004, the developer completely demolished the existing building, including its foundation, and removed contaminated soils that exceeded EGLE Residential Cleanup Criteria for Direct Contact, and some soils that exceeded GSI protection criteria. The demolished building material and contaminated soils were sent offsite for disposal. The developer was not required to remove all contaminated soils but rather removed soils that exceeded Michigan's groundwater and GSI protection criteria from areas that would not be covered by impermeable surfaces following redevelopment of the Site. The construction of the new residential condominium buildings started in September 2004 and continued until 2008. Ten units of the WSC were completed by 2008 before the property went into foreclosure in the fall of 2009. The remaining six units were completed by a new developer in 2014.

The HHRA mentions that manganese and arsenic may represent background concentrations and that a background study of metals in groundwater is necessary to determine if these metals are from the PMC Site or present as background. There is no documentation of site-specific background study on metals in groundwater at the Site.

In short, a final list of COCs for the Site for soils and groundwater was not developed and will be included as an issue and recommendation for this FYR. A background study on metals in groundwater will also need to be conducted to refine the COCs at the Site.

Vapor Intrusion

VI Removal Actions were conducted at the Site in 2016-2018 and again in 2019-2022. In 2017, EPA established OU2, specifically for VI. A supplemental OU2 RI investigating the VI pathway was completed in July 2019 (CH2M 2019). Following finalization of the RI, EPA determined that there should be only one OU at this site. References to OU2 in previous documents are now included and part of OU1.

EPA finalized a focused feasibility study in 2021 (CH2M 2021) followed by issuance of the 2022 Interim ROD. The Interim ROD will address the source of the VI and mitigate other buildings in the Study Area that poses an unacceptable current or future risk to human health. EPA currently has an interagency agreement with the US Army Corps of Engineers (USACE) to conduct the RD to implement the Interim ROD. In order to complete the full design of the AS/SVE system, additional data will be collected in the next two years under a pre-design investigation (PDI).

Institutional Controls

Table 5: Summary of Planned and/or Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Former PMC Property – Area of soil treated to industrial cleanup standards identified in Restrictive Covenants	Yes	Yes	52-19-06-206-001, 52-19-06-206-101 through 52-19-06-206-117	Prohibit contact with soil.	Restrictive Covenant recorded at Emmet County recorder’s office on May 15, 2005.
Former PMC Property – Area of TCE contaminated soil contributing to VI.	Yes	Yes	52-19-06-206-001, 52-19-06-206-101 through 52-19-06-206-117	Prevent inhalation of vapors in indoor air in excess of NCP and State risk Management criteria.	Amend 2005 Restrictive Covenant to address VI (planned).
Groundwater – current area that exceeds groundwater cleanup standards under 1998 ROD (including clean buffer zone).	Yes	Yes	52-19-06-200-017, 52-19-06-200-013, 52-19-06-200-002, 52-19-06-200-014, 52-19-06-202-009, 52-19-06-202-008, 52-19-06-202-007, 52-19-06-202-010, 52-19-06-202-011, 52-19-06-202-012, 52-19-06-201-002, 52-19-06-201-003, 52-19-06-201-004, 52-19-06-127-006, 52-19-06-127-012, 52-19-06-127-021, 52-19-06-127-007, 52-19-06-127-013, 52-19-06-127-014,	Prohibit groundwater use until cleanup standards are achieved.	City of Petoskey Code (Div. 2; Sec. 22-68), and also by consequence of municipal ownership of most of the Site if able to be updated (planned). Restrictive Covenants for

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
			52-19-06-127-008, 52-19-06-127-015, 52-19-06-127-016, 52-19-06-127-020, 52-19-06-127-017, 52-19-06-127-009, 52-19-06-127-030, 52-19-06-127-031, 52-19-06-127-032, 52-19-06-127-129, 52-19-06-127-035, 52-19-06-127-036, 52-19-06-127-037		all impacted parcels will be recorded at Emmet County Recorder's Office if ordinance cannot be updated (planned).
Groundwater – current area that exceeds groundwater cleanup goals under 1998 ROD and 2022 Interim ROD including Bayfront Park and Adjacent City Property North and Northwest of the PMC Footprint (properties over the plume not yet developed).	Yes	Yes	52-19-06-201-003, 52-19-06-201-002, 52-19-06-201-004, 52-19-06-127-018	Prohibit groundwater use until cleanup standards are achieved. Ensure any new buildings constructed investigate for the possible need of VIMS.	City of Petoskey Code (Div. 2; Sec.22-68), and also by consequence of municipal ownership of most of the Site if able to be updated (planned). Restrictive Covenants (planned).
Vapor Intrusion – properties with VI mitigation systems.	Yes	Yes	52-19-06-206-109, 52-19-06-206-110, 52-19-06-206-111, 52-19-06-206-112, 52-19-06-206-113, 52-19-06-206-114, 52-19-06-206-115, 52-19-06-206-116, 52-19-06-206-117, 52-19-06-206-107, 52-19-06-206-108, 52-19-06-206-106, 52-19-06-206-105, 52-19-06-206-104, 52-19-06-206-103, 52-19-06-206-102,	To ensure continued operation of Vapor Intrusion Mitigation Systems installed by EPA until VIMS are no longer needed. Prevent tampering and removal of any existing VI	Restrictive Covenants (planned).

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
			52-19-06-206-101, 52-19-06-127-009	mitigation systems.	

A map which depicts the current conditions of the Site and areas which do not allow for UU/UE will be developed in the IC follow up actions discussed below.

Status of Access Restrictions and ICs: Parts of the Institutional Controls required in the 1998 ROD have been implemented through the restrictive covenant at the former PMC property (currently the WSC). However, upon EPA’s further review of the City of Petoskey groundwater ordinance, it has been determined that this IC is not fully effective at limiting installation of wells in the area of the plume. While currently all residents in the study area are utilizing municipal water as their source of drinking water, the ordinance does not specifically state that installation of wells are prohibited so the ordinance would not ensure future protectiveness. Therefore, EPA will either work with the City of Petoskey to update the ordinance or pursue restrictive covenants on individual properties that overlie the groundwater plume (plus buffer zone) to ensure long-term protection. Additionally, ICs are needed to ensure adequate protection against the VI pathway which will be pursued during the Implementation of the 2022 Interim ROD as indicated in Table 5 above.

The current restrictive covenant at the WSC property requires updating to include the VI pathway and to prevent tampering or removal of any existing mitigation systems.

Current Compliance: Based on the Site inspection and interviews, EPA is not aware of Site or media uses that are inconsistent with the stated objectives of the ICs.

IC Follow up Actions Needed: In summary, the required follow-up actions are:

- Draft and finalize the IC Implementation and Assurance Plan (ICIAP) which will include long-term stewardship (LTS) procedures and a map of ICs needed at the Site.
- Amend the restrictive covenant on the PMC property to address the VI pathway.
- Implement restrictive covenants on properties over the plume not yet developed to ensure any future development is protective for vapor intrusion.
- Implement restrictive covenants at the specified properties to ensure continued operation of the VIMS.

Additionally, the EPA will work with the City of Petoskey to update its current groundwater ordinance to strengthen the language in order to maintain consistency with State regulations and guidance. However, if the City of Petoskey ordinance cannot be updated, the EPA will implement restrictive covenants for properties overlying the 5 µg/L groundwater plume exceeding the MCL for TCE plus a buffer zone, to provide a more specific prohibition on drinking-water well installation.

Long Term Stewardship: Since compliance with ICs is necessary to assure the protectiveness of the remedy, planning for LTS is required to ensure that the ICs are maintained, monitored, and enforced so that the remedy continues to function as intended. As noted above, the ICIAP will be drafted and finalized. The Plan will include the mechanisms and procedures for inspecting and monitoring compliance with the ICs, as well as communication procedures to ensure that no inconsistent uses have occurred; that ICs remain in place and are effective; and that any necessary contingency actions have been executed.

System Operations/Operation & Maintenance

Operations and Maintenance (O&M) has not been occurring at the Site since the discovery of the VI at the WSC. Due to interim decision documents and the determination during the Fourth FYR that the MNA remedy is not functioning as intended EPA will implement the interim remedy to address the source contamination, evaluate the effects on the downgradient plume then issue a ROD Amendment for the Site. As the 2022 interim ROD is being implemented, the groundwater monitoring well network will be maintained and sampled to determine the effects of the source remediation on the groundwater plume.

Post-Removal Site Control (PRSC) of existing SSDS

Because these units were not installed by the Remedial Program, the terminology “PRSC” will be used for EGLE’s role in monitoring these SSDSs to keep it separate from any future VIMS that the Remedial Program may install under the 2022 Interim ROD. Any VIMS that will be installed under the Interim ROD will be transferred to the State to conduct O&M after EPA and State inspections of the VIMS are conducted as required by the NCP. The systems are expected to remain in place and operational until complete Site remediation is achieved. Seventeen units at the WSC and one commercial building with existing operational SSDSs require regular inspection, repair, and monitoring to ensure protection of human health. These systems were installed by the Removal Program prior to the issuance of the Interim ROD to mitigate the immediate threat to human health. In order for the Removal Program to install the SSDSs, it needed assurance from EGLE that they would conduct Post-Removal Site Control (PRSC) until which time the systems would not be necessary. EGLE agreed to conduct the PRSC and the SSDS components are currently being monitored by EGLE to ensure it is functioning and to conduct annual sampling. The homeowners are required to conduct O&M in accordance with the O&M Manual that was developed by the Removal Program for each unit/building that SSDSs were installed.

EGLE has conducted the PRSC of eleven of the WSC units and one commercial building since 2018 and added six units from the WSC in 2023 for a total of 18 locations.

As part of the PRSC of the systems, EGLE conducts the following activities:

- Records pressure field extension testing on existing vapor ports.
- Documents each SSDS is functioning and no major problems exist.
- Documents that the telemetry system is functioning.
- Documents condition of the slab of the structure, particularly noting any cracks or breaches.
- Collects annual indoor air and subslab samples.

Due to over five years of subslab data collected at the 11 WSC units and the one commercial building, EGLE has ceased collection of the subslab samples from those locations and will continue with only the

indoor air sampling. At the six WSC units where data is still limited, EGLE will continue to collect both subslab and indoor samples annually. A summary of the data is discussed in the Data Review portion under Section IV below.

EGLE reported one incident in February 2023 where an SSDS fan was not functioning properly and was replaced by EGLE’s contractor. EPA has not been notified of any other issues with PRSC at the Site.

III. PROGRESS SINCE THE LAST REVIEW

This section includes the protectiveness determinations and statements from the last FYR as well as the recommendations from the last FYR and the current status of those recommendations.

Table 6: Protectiveness Determinations/Statements from the 2020 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1	Short-term Protective	<p>The remedy is currently protective of human health and the environment. The contaminated Ingalls Municipal Well was removed from service in 1995 and completely demolished in 2006. Redevelopment of the former PMC property in accordance with restrictive deed covenants has eliminated the possibility of human contact with contaminated soil. ICs are also in place to restrict the use of contaminated groundwater. A long-term groundwater monitoring program monitors the progress of concentrations toward regulatory thresholds. However, in order for the remedy to be protective in the long term, the following actions need to be taken to ensure protectiveness:</p> <ul style="list-style-type: none"> • Complete and implement the ICIAP. • Develop and implement a plan for LTS of ICs. • Amend existing ICs. • Implement additional ICs. • Issue a new decision document addressing groundwater and soils as sources of VI and requiring additional ICs.

Table 7: Status of Recommendations from the 2020 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
1	Documents and procedures should be developed and implemented to ensure that implemented ICs are effective and properly maintained,	Complete and implement the ICIAP.	Addressed in Next FYR	Initial drafting of the ICIAP was put on hold due to efforts related to the Interim ROD and start of the RD. Work will begin on this recommendation when the PDI is completed.	

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
	monitored, and enforced.				
1	Procedures are not in place to ensure LTS of ICs at the Site.	Develop and implement a plan for LTS of ICs.	Considered But Not Implemented	LTS procedures will be incorporated into the ICIAP.	As of the issuance of this FYR.
1	VI has been identified as a new exposure pathway of concern	Amend the 2005 restrictive covenant for the PMC property to address the VI pathway.	Addressed in Next FYR	Implementation was put on hold due to finalizing the Interim ROD and start of the RD. Work will begin on this recommendation during the PDI.	
1	VI has been identified as a new exposure pathway of concern.	Implement additional ICs on properties to ensure continued operation of vapor intrusion mitigation systems installed preemptively by EPA until soil gas concentrations reach target levels.	Addressed in Next FYR	Implementation was put on hold due to finalizing the Interim ROD and start of the RD. Work will begin on this recommendation during PDI.	
1	VI has been identified as a new exposure pathway of concern.	Implement additional ICs on properties over the TCE plume to prevent residential use and require VI mitigation systems installed on the property being developed.	Addressed in Next FYR	Implementation was put on hold due to finalizing the Interim ROD and start of the RD. Work will begin on this recommendation when PDI is completed	
1	Additional ICs to restrict use of TCE contaminated groundwater.	Implement restrictive covenants for properties overlying the 5 µg/L TCE groundwater plume to provide a more specific prohibition on drinking water well installation and to supplement the existing City of Petoskey code.	Addressed in Next FYR	Implementation was put on hold due to finalizing the Interim ROD and start of the RD. Initial discussions with the City indicate the City of Petoskey is amenable to update the City's ordinance. If so, the restrictive covenants for each property may not be necessary. Work will begin on this	

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
				recommendation when PDI is completed.	
1	The existing remedy does not address VI and does not include all necessary ICs for the site, and attenuation of groundwater concentrations is not occurring rapidly enough.	Issue a new decision document addressing groundwater and soils as sources of VI and requiring additional ICs.	Completed	The 2022 Interim ROD addresses treating the source of the VI (groundwater and soils) at the source area. A final remedy for the Site will be issued after implementation of the 2022 Interim ROD.	9/27/2022

OTHER FINDINGS

In addition, the following recommendations were identified during the 2020 FYR, but do not affect current or future protectiveness:

Table 8: Status of Other Findings from the 2020 FYR

Other Findings from 2020 FYR	Current Status
Prepare an updated map showing all areas where ICs are needed.	This is ongoing and will be included in the ICIAP.
Prepare an updated O&M Plan to specify routine maintenance activities for the upgraded groundwater plume and to include information about long-term groundwater monitoring.	This is on hold until the 2022 Interim ROD has been implemented.
Conduct an evaluation of the existing monitoring well network to see if any additional wells are required.	This fifth FYR inspection included an evaluation of the current monitoring wells. During the RD, the current monitoring wells will be redeveloped and additional nested well sets will be installed north of the WSC to evaluate the VI pathway. A full evaluation of the monitoring well network is anticipated upon implementation of the 2022 Interim ROD.
Prepare a monitoring well abandonment plan for the PMC Site.	This is ongoing.
Collect another round of monitoring well samples (to include some deeper wells and address seasonal variations) to confirm that PFOA and PFOS are not contaminants of concern for the PMC Site.	PFAS sampling will be conducting during the PDI. This recommendation will be elevated to the issues and recommendations in Section VI of the FYR.
Although sufficiently protective in regard to CERCLA requirements, the City of Petoskey Groundwater Protection Ordinance should be revised to maintain consistency with EGLE regulations and guidance.	Upon further review of the City of Petoskey Groundwater Protection Ordinance, it has been determined that the ordinance is not fully protective in the long-term. Specifically, it does not prohibit the installation of wells.

Other Findings from 2020 FYR	Current Status
	The RPM conducted an interview with city officials during this FYR. City officials will discuss with EPA the possibility to update their ordinance. Because this issue affects long-term protectiveness, it will be elevated to the issues and recommendations in Section VI of the FYR.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

A public notice was made available by a newspaper posting in the Petoskey News, on 7/27/2024, stating that there was a FYR and inviting the public to submit any comments to EPA (Appendix D). The results of the review and the completed Fifth FYR report will be made available at the Site information repository located at the Petoskey Public Library, 500 E. Mitchell Street, Petoskey and the PMC Superfund website: <https://www.epa.gov/superfund/pmc-groundwater>. EPA issued a Community Involvement Plan in 2019.

EPA held two public availability sessions inviting residents in the study area to ask EPA questions or communicate any concerns regarding the Site and upcoming implementation of the 2022 Interim ROD. The public availability sessions were held on July 30 and 31st, 2024 at the Petoskey Public Library. In attendance was the RPM (Cheryl Kondreck), Community Involvement Coordinator (Ruth Muhtsun), and EGLE representative (Beth Mead-O’Brien). During the July 30th session, USACE’s technical lead (Zach Jelenek) and real estate lead (Jessica Harbert) were present to answer any technical questions regarding the upcoming RD. EPA was also using this availability session to obtain access agreements to conduct the RD for the Site.

Conversations at the public availability sessions were mainly about the upcoming investigation and the timing of the sampling to be conducted for the PDI. There were some concerns raised on increasing the sampling frequency and disruption to residents at the WSC. EPA provided an explanation of the importance of sampling prior to, during, and after the startup of the system to ensure health and safety of residents as well as monitoring the progress of the cleanup. It was explained that the sampling frequency may be increased during startup of the system and would be reduced thereafter. Most residents that attended appeared to understand the process. EPA will try to minimize disruption to residents as much as practicable.

During the FYR process, interviews were conducted to document any perceived problems or successes with the remedy that has been implemented to date. Interviews with City Officials, a representative from the Little Traverse Bay Bands of Odawa Indians, and a member of the WSC board were interviewed. All understood the need for the implementation of the interim remedy to address the source area, were eager to get moving on the implementation, and look forward to increased communication from EPA regarding the upcoming work.

Data Review

Vapor Sampling

Because the 2022 Interim ROD is in the RD phase of the Remedial Process, the remedial components from the 2022 Interim ROD are not being evaluated in this FYR. The data associated with the VI removal actions are discussed here. As described above, EGLE has conducted the PRSC of the SSDSs at the WSC units and one commercial building since 2018 and added six units from the WSC in 2023. Based on the results of the indoor air samples collected during this FYR period (2019 to 2024), the SSDSs are functioning and have reduced the TCE in indoor air to below the cleanup criteria ($2.1 \mu\text{g}/\text{m}^3$). Indoor air sample results for TCE were non-detect in all but one unit where TCE was detected ($1.6 \mu\text{g}/\text{m}^3$) but was below the cleanup criteria ($2.1 \mu\text{g}/\text{m}^3$). The detected TCE was only on the top floor of the unit and not from the first or second floors, suggesting that the measured concentration was likely not from VI. If the detected TCE was from VI, the first and second floors would most likely have detected levels of TCE. Subslab samples from this particular unit at this sampling event from the two sample ports were $64 \mu\text{g}/\text{m}^3$ and $130 \mu\text{g}/\text{m}^3$. In general, subslab samples results show TCE above the cleanup goals ranging from non-detect to $980 \mu\text{g}/\text{m}^3$ during the FYR reporting period.

Currently the SSDSs installed are functioning as intended and protective of human health. The annual data show indoor air below the clean-up goals. However, the sub-slab data is still above clean-up goals and the future risk will be present as long as the source is present. The future risk will be addressed through the implementation of the Interim ROD. The SSDSs will need to be maintained until cleanup goals have been achieved to protect human health.

Additional data will be collected during the PDI to help inform the design of the AS/SVE system in the summer of 2025. During the PDI additional buildings surrounding the source area will be investigated to determine if VIMS will be necessary.

Current Groundwater Status

Due to interim decision documents and based on the Fourth FYR conclusion that the MNA remedy is not functioning as intended, EPA will move forward with the implementation of the 2022 Interim ROD and will issue ROD Amendment upon completion of the Interim ROD.

The details regarding the most recent groundwater sampling are documented in the Fourth FYR. In summary, the groundwater plume extends from the former PMC facility toward the Little Traver Bay to the north/northwest. The highest concentration of TCE in the groundwater from the last sampling event in 2018 was $36 \mu\text{g}/\text{L}$ at monitoring well PS-4 (Appendix B, Figure 2), located adjacent to the source area. Data presented in the Fourth FYR concluded that although concentrations have decreased since implementation of the 1998 ROD, concentrations have stabilized above the cleanup goal indicating that natural attenuation of the plume is currently limited. In addition, DCE and VC – breakdown products of TCE that might indicate that attenuation through degradation is occurring – were seen in only a few wells historically and were not detected in 2018 (the most recent sampling event). The aquifer is generally aerobic; therefore, intrinsic bioremediation via reductive dechlorination is limited. The groundwater flow at the Site is dependent on the Lake Michigan water levels. When the Lake levels are high, the groundwater will generally flow to the south and when Lake levels are low, the groundwater will flow generally to the north (toward the Lake). The groundwater gradient at the Site is relatively flat and therefore, the groundwater velocity at the Site is near zero. The plume generally

appears to be at quasi-equilibrium and stagnant. There is no indication that the plume would migrate beyond the current monitoring well network.

The presence of TCE in both the vadose and saturated zones at the source area is acting as an ongoing source to groundwater, contributing to the limited attenuation and persistence of the plume. The Fourth FYR determined that the 1998 groundwater remedy was not functioning as intended due to this stall of natural attenuation.

Site Inspection

The inspection of the Site was conducted on July 30th and 31st, 2024. In attendance were Cheryl Kondreck, EPA RPM and Sonny Divita, EPA Field Services Section; Beth Mead-O'Brien and Barb Vetort of EGLE; Traven Michaels of the Little Bay Band of Odawa Indians; and Zach Jelenek of USACE. The purpose of the inspection was to assess the protectiveness of the 1998 remedy.

The source area has been completely redeveloped with residential condominiums (WSC) and therefore there are no fences or limitations to Site access that need maintenance. The groundwater remedy is monitored natural attenuation and therefore, all monitoring wells at the Site were located and inspected when access was allowed. EPA's Field Services Section personnel (Divita) was present and performed downhole camera inspection to provide a preliminary assessment for each monitoring wells in which we had access. EPA could not access two groundwater monitoring wells located on one private property due to access denial. Two monitoring wells on the source area property (WSC) CMW01 and CMW02 could not be inspected because they were partially sealed shut during asphalt resurfacing. The well caps and bolts were intact however, due to the asphalt seeping in between the cover and the concrete pad, EPA could not open the well covers without proper tools. EPA expects these monitoring wells to be useful and in good condition and will be accessed using proper tools during the PDI. In summary, all but 2 or 3 wells are in usable condition; however, all need redevelopment prior to sampling. Some additional minor maintenance such as new well plugs are required. Details of the Site inspection including photographs, downhole camera inspection, and condition of each well is included in the FYR Inspection Report provided in Appendix E.

In addition to the monitoring well inspection, EPA located and inspected all of the soil gas wells that were installed during the Supplemental RI. All soil gas wells appeared to be in good condition. A few soil gas wells could not be opened because of the asphalt resealing at the WSC. One soil gas well located in the driveway of a private property was partially sealed due to concrete resurfacing. With the proper tools, it is expected these wells will be accessible during the PDI.

EPA inspected one SSDS at the WSC during the FYR inspection. Because EGLE had planned on conducting their annual PRSC in August 2024, to minimize disturbance to the property owners, EPA relied on EGLE's inspection of the SSDSs. No issues were reported on the SSDSs following the 2024 EGLE inspection.

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

No.

Question A Summary:

As documented in the Fourth FYR for the Site, the soil and groundwater remedy defined in the 1998 ROD continues to prevent exposures to human health and the environment through implementation of some ICs and the residual benefits of the previous excavation of contaminated soil and SVE. However, natural attenuation of the groundwater TCE plume is not occurring at a rapid enough rate and the groundwater ordinance is not an effective IC for private properties on and near the groundwater plume.

VIMS installed by EPA removal actions are preventing VI exposure in the buildings with the highest potential risk. An Interim ROD has been issued to address the source of the VI beneath the WSC. EPA is currently in the RD phase of implementing the ROD and therefore remedial components associated with the 2022 Interim ROD were not evaluated in this FYR. Additional investigation is expected to occur in the summer of 2025 to gather information to inform the RD and collect necessary data to determine if additional VIMSs are necessary. Based on data collected to date, there are no current risk to human health. Because the 2022 Interim ROD is in the RD phase of the Remedial Process, the remedial components from the Interim ROD are not evaluated in this FYR.

Remedial Action Performance

An evaluation from the Fourth FYR of TCE in the groundwater indicated that TCE concentrations are generally stable, although some wells had decreasing trends. Attenuation is primarily occurring through volatilization and dispersion. Intrinsic bioremediation via reductive dechlorination is very limited. As a result, the plume is generally at quasi-equilibrium. The groundwater gradient at the Site is nearly zero therefore, migration of the plume would not occur to areas outside of the current monitoring well network and any reduction in concentration is due to dissolution. However, the presence of TCE in the vadose and saturated zones is acting as an ongoing source to groundwater, contributing to the limited attenuation and persistence of the plume. Due to the source of this contamination, the MNA remedy has not achieved the cleanup goals and the Fourth FYR identified that the MNA remedy is not functioning as intended. A contingency remedy has not been established for the Site and after implementation of the 2022 Interim ROD, a ROD Amendment for the Site will be issued to determine the final groundwater remedy for the Site. Currently there are no private wells within the study area of the Site, and all residents are connected to municipal water.

The lack of plume attenuation, combined with the presence of TCE in soil gas above screening levels, has resulted in the need for implementation of pre-emptive VI mitigation at properties with identified risk. Properties that posed a current risk to human health were mitigated and some properties were pre-emptively mitigated. Additional properties will be sampled under the PDI to determine if VIMS will be needed. The Interim ROD is in the Remedial Design stage of the remedial process. The implementation of the 2022 Interim ROD to address the source of contamination in both the vadose and saturated zones through AS/SVE should help to reduce downgradient contamination of groundwater. The EPA anticipates that the AS/SVE system would run for approximately 5 years and then followed by several years of monitoring to determine the degree of contaminant rebound. Once the Interim ROD is completed (i.e., has achieved the RAO) and after a period of post-system shutdown

monitoring, EPA will formalize a final ROD Amendment for the Site which will include a final remedy for both groundwater and VI.

System Operations/O&M

Operations and Maintenance (O&M) has not been occurring at the Site since the discovery of the VI pathway at the WSC. Due to interim decision documents and the determination during the Fourth FYR that the MNA remedy is not functioning as intended EPA will implement the interim remedy to address the source contamination, evaluate the effects on the downgradient plume then issue a ROD Amendment for the Site. As the 2022 interim ROD is being implemented, the groundwater monitoring well network will be maintained and sampled to determine the effects of the source remediation on the groundwater plume. Items that will need to be addressed during the PDI of the 2022 Interim ROD are redevelopment and installation of wells that are damaged at the Site as well as fixing well caps that have been sealed due to resurfacing at the WSC parking lot and on a private driveway.

Post-Removal Site Control

Currently EGLE has assumed PRSC maintenance of the SSDS at the Site. The systems are checked on an annual basis and the telemetry system alerts EGLE when there is a problem with SSDS operation. The annual inspections and telemetry system assure that the SSDSs are protective of human health.

Implementation of Institutional Controls and Other Measures

ICs on the former PMC property (now the WSC) were implemented when a restrictive covenant was recorded in May 2005. The existing ICs on the former PMC property remain protective because they prohibit contact with soil and prevent groundwater use. No groundwater usage was observed during the FYR Site Inspection. However, the existing restrictive covenant needs to be amended to address the VI pathway. Restrictive covenants are needed on properties over the plume in un-developed areas to restrict residential use due to VI potential which should also include VIMS requirements if buildings are developed. ICs are also needed on specific properties to ensure continued operation of SSDSs installed preemptively by EPA until multiple lines of evidence demonstrate they are no longer needed.

There has not been installation of any drinking water wells on the rest of the Site. The City of Petoskey ordinance is not consistent with certain State legal requirements; as examples, a variance provision is allowed, there are no enforcement provisions stated, there are no notification requirements, there is no statement of the purpose for the restriction of residential well installation, and the ordinance does not provide any allowances for establishing restrictions (there is no way for residents to know there are areas of contamination from which they need to be protected). EPA plans to work with the City of Petoskey to strengthen the ordinance. If this is not possible, EPA plans to pursue restrictive covenants for properties overlying the 5 µg/L groundwater plume (plus a clean buffer zone) to provide a more specific prohibition on drinking water well installation.

An ICIAP needs to be drafted, finalized, and implemented for the Site which incorporates LTS procedures including mechanisms and procedures for inspecting and monitoring compliance with the ICs as well as communications procedures.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

No.

Question B Summary:

The standards and to be considered requirements (TBCs) implemented as part of the decision document for the Site were reviewed against current standards. All other groundwater and soil standards and TBCs remain valid. All residents within the Study Area are connected to municipal water supply and no private wells exist.

The Supplemental RI activities detailed in the Fourth FYR identified a need to treat the source of the VI at the Site. The 2022 Interim ROD presents the RAOs to address the VI and interim cleanup goals that are Site-specific for TCE which have not changed since the issuance of the Interim ROD. Implementation of the Interim ROD will also help to address the groundwater plume for the Site.

Changes in Standards and TBCs

The 1998 ROD identified metals in groundwater contributing to the overall risk to human health for the groundwater ingestion pathway but stated that it may be naturally occurring background concentrations. A background study for metals in groundwater is needed to determine if these metals are truly contaminants associated with the Site. Additionally, the 1998 ROD stated that site-specific criteria for the GSI would be developed for the Site to help refine the COCs at the Site and to determine the final cleanup criteria for both groundwater and soils. These site-specific criteria will be developed, and any changes will be documented in the Site file as part of the chemical-specific ARARs for the Site as stated in the 1998 ROD.

Changes in Toxicity and Other Contaminant Characteristics

No other changes in toxicity or contaminant characteristics have been identified. The VI pathway is being addressed in the Interim ROD.

Changes in Risk Assessment Methods

As described in the Fourth FYR, human health risks above EPA's risk range for the inhalation pathway were identified and mitigated. The future risk is being addressed under the Interim ROD by treating the source of the VI. PFAS will be sampled in groundwater to determine if is present at concentrations that pose and unacceptable risk to human health.

Changes in Exposure Pathways

An Interim ROD to address the source of VI was issued in 2022 and is currently in the RD phase of the remedial process. Additional exposure pathways for the Site have not been identified.

In 2018, six wells were sampled for per- and polyfluoroalkyl substances (PFAS) because of the potential that historical activities at the Site used these chemicals. PFAS were detected but not in concentrations greater than the applicable EPA drinking water health advisory levels or MDEQ Residential Shallow Groundwater screening levels at the time the samples were collected. PFAS will be sampled for during the next FYR period from all monitoring wells at the Site. This will not affect current protectiveness at the Site due to the ICs in place to restrict groundwater use at the Site and all residents are connected to the municipal water supply. Additional PFAS sampling is recommended to determine if there is risk to human health from PFAS in groundwater.

Expected Progress Towards Meeting RAOs

The groundwater remedy from the 1998 ROD is progressing more slowly than expected and is not likely to meet RAOs in a reasonable timeframe. EPA will implement the 2022 Interim ROD, assess the VI pathway and groundwater contamination at the Site after the Interim ROD RAOs are achieved, and then issue a final ROD Amendment for the Site that will address any remaining groundwater contamination and sources of VI.

The Interim ROD will address both vadose-zone soil and groundwater that have been identified as sources that contribute to the current and potential future VI exposure pathway and the downgradient groundwater plume.

QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy?

Yes.

The groundwater level at the Site is influenced by the stage of Lake Michigan. Predicted rising lake water levels may enhance dispersion and volatilization of the plume. Rising groundwater levels may also increase the potential for VI. Future monitoring of groundwater at the Site should include an evaluation of the Lake level elevations in comparison to the groundwater elevation at the Site. If drastic changes in Lake levels are observed, additional monitoring points for both groundwater and vapor intrusion may be necessary to ensure there is no migration of contaminants to unintended areas of the Site.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations	
OU(s) without Issues/Recommendations Identified in the Five-Year Review:	
None	
Issues and Recommendations Identified in the Five-Year Review:	
OU(s): 1	Issue Category: Institutional Controls

	Issue: Documents and procedures should be developed and implemented to ensure that ICs are effective and properly maintained, monitored, and enforced. LTS procedures should be incorporated into the ICIAP.			
	Recommendation: Draft, finalize, and implement the ICIAP.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	EPA	EPA/State	3/30/2026

OU(s): 1	Issue Category: Institutional Controls			
	Issue: VI has been identified as an exposure pathway of concern.			
	Recommendation: Amend the 2005 restrictive covenant for the WSC property to address the VI pathway.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	EPA	EPA/State	3/30/2026

OU(s): 1	Issue Category: Institutional Controls			
	Issue: VI has been identified as an exposure pathway of concern.			
	Recommendation: Implement additional ICs on properties to ensure continued operation of VIMS until soil gas concentrations reach target levels.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	EPA	EPA/State	3/30/2026

OU(s): 1	Issue Category: Institutional Controls			
	Issue: VI has been identified as an exposure pathway of concern.			
	Recommendation: Implement additional ICs on undeveloped properties over the TCE plume and if properties are developed, require VI investigation to determine if VIMS are necessary.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	EPA	EPA/State	3/30/2026

OU(s): 1	Issue Category: Institutional Controls			
	Issue: Current City of Petoskey Ordinance doesn't properly restrict groundwater use at the Site.			

	Recommendation: Work with the City of Petoskey to update the Ordinance to follow State regulations or pursue restrictive covenants at properties that overlay the groundwater plume (including a clean buffer zone).			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	EPA	EPA/State	3/30/2026

OU(s): 1	Issue Category: Other			
	Issue: The 1998 ROD did not specify final COCs or site-specific GSI criteria for the Site.			
	Recommendation: Develop a final COC list and cleanup levels for the Site for groundwater and soils based on site-specific GSI criteria.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	EPA	EPA/State	3/30/2026

OU(s): 1	Issue Category: Other			
	Issue: Metals may be naturally occurring in groundwater.			
	Recommendation: Conduct a background study for metals to determine whether metals detected in Site groundwater are attributable to the PMC Site or background.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	EPA	EPA/State	3/30/2029

OU(s): 1	Issue Category: Monitoring			
	Issue: PFAS compounds were detected in some of the six wells sampled in 2018.			
	Recommendation: Conduct further PFAS evaluations, including sampling all wells using the most current analytical method, to determine if PFAS contamination detected in 2018 is Site-related and present in concentrations that pose an unacceptable risk.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	EPA	EPA/State	3/30/2026

OU(s): 1	Issue Category: Monitoring			
	Issue: Rising Lake Michigan water levels may enhance dispersion and volatilization of the plume and may increase the potential for VI.			

<p>Recommendation: Future monitoring of groundwater at the Site should include an evaluation of the Lake Michigan water levels in comparison to the groundwater elevation at the Site. If consequential changes in Lake levels are observed, additional monitoring points for both groundwater and vapor intrusion may be necessary to ensure that the plume is not expanding and thereby creating an expanded area of concern for the VI pathway.</p>				
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	EPA	EPA/State	3/30/2029

OTHER FINDINGS

In addition, the following recommendations were identified during the Fourth FYR and are being carried over in this FYR if the recommendation was not elevated to an issue and recommendation above. These recommendations may improve performance of the remedy, but do not affect current nor future protectiveness:

- Prepare an updated map depicting the current conditions of the Site, areas which do not allow for UU/UE and showing all areas where additional ICs are needed.
- Fix monitoring well caps in the WSC parking lots where asphalt resurfacing has partially sealed the caps.
- Redevelop all wells at the Site. Determine which wells need to be replaced due to damage in the wells or inaccessibility issues.
- Prepare a monitoring well abandonment plan for the PMC Site.

VII. PROTECTIVENESS STATEMENT

<p>OU1 and Sitewide Protectiveness Statement(s)</p> <p><i>Protectiveness Determination: Short-term Protective</i></p>
--

Protectiveness Statement: The remedy at the PMC Site currently protects human health and the environment because the contaminated Ingalls Municipal Well was removed from service, redevelopment of the former PMC property in accordance with restrictive deed covenants restricts potential human contact with contaminated soil and restricted groundwater use, and VIMS have been installed to mitigate VI. However, in order for the remedy to be protective in the long term, the following actions need to be taken to ensure protectiveness:

- Draft, finalize, and implement the ICIAP.
- Amend the 2005 restrictive covenant for the WSC property to address the VI pathway.
- Implement additional ICs on properties to ensure continued operation of VIMS until soil gas concentrations reach target levels.
- Implement additional ICs on undeveloped properties over the TCE plume and if properties are developed, require VI investigation to determine if VIMS are necessary.
- Work with the City of Petoskey to update the Ordinance to follow State regulations or pursue restrictive covenants at properties that overlay the groundwater plume (including a clean buffer zone).
- Develop a final COC list and cleanup levels for the Site for groundwater and soils based on site-specific GSI criteria.
- Conduct a background study for metals to determine whether metals detected in Site groundwater are attributable to the PMC Site or background.
- Conduct further PFAS evaluations, including sampling all wells using the most current analytical method, to determine if PFAS contamination detected in 2018 is Site-related and present in concentrations that pose an unacceptable risk.
- Future monitoring of groundwater at the Site should include an evaluation of the Lake Michigan water levels in comparison to the groundwater elevation at the Site. If consequential changes in Lake levels are observed, additional monitoring points for both groundwater and vapor intrusion may be necessary to ensure that the plume is not expanding and thereby creating an expanded area of concern for the VI pathway.

VIII. NEXT REVIEW

The next FYR report for the PMC Groundwater Superfund Site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

- CH2M. 2019. Remedial Investigation Report – Operable Unit 2, PMC Groundwater Site, Petoskey, Michigan. July.
- CH2M. 2021. Focused Feasibility Study, Petoskey Manufacturing Company, Groundwater Superfund Site, Petoskey, Emmet County, Michigan. September.
- EPA. 1984. Administrative Consent Order In The Matter of Petoskey Manufacturing Company, Inc. August 23.
- EPA 1987. Administrative Order by Consent In the Matter of Petoskey Manufacturing Company, Inc., Petoskey, Michigan. June 3.
- EPA. 1990. EPA letter to Petoskey Manufacturing Company regarding Discontinuation of Petoskey Manufacturing Company's Authority to Conduct RI/FS. September 25.
- EPA. 1995. Interim Action Record of Decision, Petoskey Municipal Well Field, Petoskey, Michigan. June 14.
- EPA. 1998. Record of Decision for the Petoskey Municipal Well Field Site In Petoskey, Michigan. September 30.
- EPA. 2000. Superfund Preliminary Close-Out Report, Petoskey Municipal Well Field Superfund Site, Petoskey, Michigan. February 18.
- EPA. 2022. Interim Record of Decision, PMC Groundwater Superfund Site, Petoskey, Emmet County, Michigan. September 27.
- Malcolm Pirnie Engineers, LLP. 1998. Phase II Remedial Investigation Report for Petoskey Manufacturing Site, Petoskey, Michigan. February 18.

APPENDIX B – FIGURES



Legend

- Former PMC Property Boundary
- Study Area

Figure 1
 Site Location Map
 Focused Feasibility Study
 PMC Groundwater Superfund Site
 Petoskey, Michigan



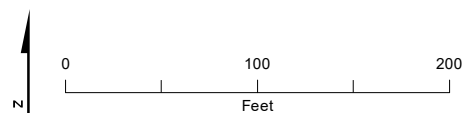


Notes:
 All concentrations are in µg/L.
 All depths are in feet below ground surface.
 µg/L = micrograms per liter
 EPA = U.S. Environmental Protection Agency
 MDEQ = Michigan Department of Environmental Quality
 TCE = trichloroethene
 TCR = target cancer risk
 THQ = target hazard quotient

J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
 U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
 UJ = The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the action limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
 1. The EPA tap water regional screening levels (RSLs; EPA, November 2017) are based on a TCR of 1×10^{-6} and a THQ of 1. Exceedances of this criterion are bold.
 2. The EPA residential groundwater vapor intrusion screening levels (VISLs) were developed from the EPA VISL calculator using the November 2017 EPA RSLs. The VISLs were calculated based on a

TCR of 1×10^{-6} and a THQ of 1. Exceedances of this criterion are shaded grey.
 3. The MDEQ residential shallow groundwater media-specific volatilization to indoor air recommended interim action screening levels (RIASLs; MDEQ, August 2017). Exceedances of this criterion are underlined.

Figure 2
 TCE Results in Groundwater
 Fifth Five Year Review Report
 PMC Groundwater Superfund Site
 Petoskey, Michigan



APPENDIX C – TEMPORARY GSI CRITERIA LIST

Groundwater/ Surface Water Interface Criteria
Developed by the Michigan Department of Environmental Quality

For groundwater discharges to the Great Lakes and their connecting waters or discharges in close proximity to water supply intake(s) in inland surface waters, the generic GSI criterion is the Surface Water Drinking Water Value (SWDWV) listed in the table below except for those SWDWV indicated with an asterisk. For SWDWV with an asterisk, the generic GSI criterion is the lesser of the SWDWV, the wildlife value (WV) and the calculated Final Chronic Value (FCV). Soil protection criteria based on the SWDWV are listed below except for those values with an asterisk.

Note that this list does not include all contaminants of concern for the Petoskey Municipal Well Field Site. U.S. EPA may elect to work with MDEQ on the development of site-specific GSI criteria which account for the mixing zone present at the point of groundwater discharge into Lake Michigan.

Chemical	Chemical Abstract Service Number	Surface Water Drinking Water Values	Soil Protection Criteria for Surface Water Drinking Water
		(ug/L)	(ug/Kg)
Acrylonitrile	107131	0.87	17
Alachlor	15972608	3.5	70
Arsenic	7440382	50	16,000
Atrazine	1912249	4.3	86
Benzene	71432	12	240
Cadmium	7440439	2.5*	*
Carbon tetrachloride	56235	5.6	110
Chloroform	67663	77	1,500
Chromium (III)	16065831	120*	*

Cyanazine	21725462	10 {M}	200
3,3'-Dichlorobenzidine	91941	0.3 {M}	500
1,2-Dichloroethane	107062	6	120
1,1-Dichloroethylene	75354	24	480
1,2-Dichloropropane	78875	9.1	180
N,N-Dimethylacetamide	127195	700	14,000
Hexachloroethane	67721	5.3	1,500
Lead	7439921	14*	*
Methyl-tert-butyl ether (MTBE)	1634044	120	2,400
Methylene chloride	75092	47	940
Molybdenum	7439987	120	2,400
Pentachlorophenol	87865	1.8*	*
1,1,2,2-Tetrachloroethane	79345	3.2	64
Tetrachloroethylene	127184	11	220
Thallium	7440280	1.2	910
1,1,2-Trichloroethane	79005	12	240
Trichloroethylene	79016	29	580

APPENDIX D – PUBLIC AD

Q&A

Continued from Page 1A

Tim Howard

Q: Introduce yourself, including your age and profession.

A: My Name is Tim Howard and I am running for Resort Township Trustee. I am 47 years old and was born and raised in Resort Township, where I currently reside with my wife Rhonda and our two children. After graduation from Petoskey High School I attended North Central Michigan College and later Northern Michigan University, where I received my Bachelor of Science degree. I have spent my entire professional career in the energy industry.

Q: Have you previously held an elected position?

A: This is my first time running for a political position through an election process, however, I have held numerous roles of similar capacity. I currently sit on the Board of Directors for the Michigan Oil and Gas Association (past committee chair) and previously served as president of the Northern Michigan Antique Flywheelers after serving several

years as a trustee. This past January I was appointed to the Resort Township Planning Commission for a two-year term.

Q: Why are you running for office?

A: I am running for office because I strongly believe that you should be involved in the community that you live in. Resort Township is a beautiful place to live and visit and if elected my number one priority would be to prioritize those qualities that make our area unique.

Q: What are the biggest challenges facing the township?

A: I feel the biggest challenges facing Resort Township are those of responsible development. Due to the natural beauty of the area and our proximity to the City of Petoskey, a lot of people (both full-time and seasonal) would like to call our township home. A balance is required to provide adequate opportunities for development while maintaining the open space/lake views and agricultural heritage that have defined Resort Township and make it such a unique place to live and visit.

Q: If elected, what would be your main priorities?

A: If elected my main priorities would be to represent my constituents in an honest and ethical manner while keeping the township's best interests at heart. I believe that governing bod-

ies, especially at the township level, should be as transparent as possible with their residents. To that regard, I would work to improve communications between the board and residents of the township. I would also prioritize improving the accessibility of documents such as meeting minutes, township news and events and other relevant items to residents of Resort Township.

Alfred (Al) Welsheimer

Q: Introduce yourself, including your age and profession.

A: Alfred (Al) Welsheimer, 60 years old, lifelong resident of Resort Township. Married for 35 years with two grown sons; one resides in Petoskey and the other in Owosso with our two beloved grandkids. I proudly serve as the current township fire chief, bringing 42 years of dedicated service to our community's fire department.

Q: Have you previously held an elected position?

A: I was appointed approximately two years ago following the resignation of a trustee. As such, I have not been elected but rather appointed to serve in this role.

Q: Why are you running for office?

A: Promoting responsible fiscal management while preserving the rural character of our township. Emphasizing transparency, accountability and ecology preservation in our lakeside community. Over my 17 years of attending meetings, communication has often been a significant issue.

Q: What are the biggest challenges facing the township?

A: Transparency. Collaborative teamwork. Some current members of the township board believe they hold all decision-making power and disregard input from other board members. Over the last 20 years, there has been a pattern of spending without maintaining a sufficient fund balance. It's essential to prioritize maintaining the upkeep of all the trails and parks owned by the township. The township should save for major projects to avoid the need for borrowing money.

Q: If elected, what would be your main priorities?

A: Promoting collaborative teamwork: Working with the planning commission to preserve the rural character of our township. Continuing engagement with Walloon Lake residents to safeguard our lake. Prioritizing blight remediation efforts.

— Contact reporter Karly Graham at kgraham@petoskeynews.com. Follow her on Twitter at [@KarlyGrahamJRN](https://twitter.com/KarlyGrahamJRN).

Queen

Continued from Page 1A

Gemma Bonney was named the first runner-up, earning a \$1,000 scholarship. Kaydence McPherson, who secured the second runner-up position, received a \$500 scholarship.

The Miss Congeniality title, which comes with a \$250 scholarship, was awarded to Trista Miller, who was recognized for her kindness and camaraderie among the contestants.

The Venetian Queen coordinator Tanya Simpson addressed the crowd on Wednesday, highlighting the achievements of all the participants and the importance of the event in fostering community spirit and supporting educational aspirations.

Kita was crowned by the outgoing Venetian Queen, Karlee Eaton.

— Contact reporter Annie Doyle at (231) 675-0099 and adoyle@charlevoixcourier.com



Kaydence McPherson is crowned 2nd runner-up in the Venetian Queen Coronation ceremony on Wednesday, July 24. ANNIE DOYLE/CHARLEVOIX COURIER



Avery Kita is crowned the 2024 Venetian Queen by the outgoing queen during the coronation ceremony. ANNIE DOYLE/CHARLEVOIX COURIER

THUNDERCATS SOFTBALL

2024-2025 TRYOUTS

Tuesday, July 30th	Wednesday, July 31st
10U & 12U @ 6:00p-7:30p	10U & 12U @ 6:00p-7:30p
14U & 16U @ 7:30p-9:00p	14U & 16U @ 7:30p-9:00p

All tryouts will be held at Huron Shores Little League Complex North fields (US-23 North behind Alpena Township fire station).

If you are unable to make these dates, please contact us to schedule an individual try-out time for August 3rd.

For more information, please contact Greg Kamyszek @ (989) 464-0896 or email thundercatssoftball@outlook.com

All players should arrive at least 15 minutes early to register. Visit our website @ www.thundercats-softball.com

PN-39856435



U.S. EPA Begins Review of the PMC Groundwater Superfund Site Petoskey, Michigan

The U.S. Environmental Protection Agency is conducting a five-year review of the PMC Groundwater Superfund site in Petoskey, Michigan. The Superfund law requires regular checkups of sites that have been cleaned up – with waste managed on-site – to make sure the cleanup continues to protect people and the environment. This is the fifth review of the site.

The EPA's cleanup included:

- removing contaminated soil and disposing it offsite.
- installing and operating a soil vapor extraction system.
- monitoring natural attenuation of groundwater.
- placing limitations on use of the site and site access.

Long-term monitoring and groundwater cleanup continues in an area under Water Street and Bayfront Park. In 2022, EPA issued an Interim Record of Decision (ROD) that addresses contaminated vapors from the site. EPA's cleanup for this Interim ROD includes installing and operating a soil vapor extraction system with air sparging of the groundwater.

More information is available at www.epa.gov/superfund/pmc-groundwater. The review should be completed by March 2025.

The five-year review is an opportunity for you to tell EPA about site conditions and any concerns you have. Contact:

Ruth Muhtsun
Community Involvement
Coordinator
312-886-6595
muhtsun.ruth@epa.gov

Cheryl Kondreck
Remedial Project
Manager
312-353-4872
kondreck.cheryl@epa.gov

You may also call U.S. EPA toll-free at 800-621-8431, 9:00 a.m. to 5:30 p.m., weekdays.

PN-39921867

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APPENDIX E – FYR INSPECTION REPORT



Region 5
SEMD Field Activity Report
Remedial Response Section 1
77 West Jackson Boulevard, Chicago, Illinois 60604

Site Name: PMC Groundwater Superfund Site
Site Address: 200 West Lake Street, Petoskey, MI
Site ID #: MID006013049
Date of Field Activity: July 30, 31 and August 1, 2024

Five Year Review Site Inspection Report

Participants

Cheryl Kondreck	EPA	kondreck.cheryl@epa.gov
Sonny Divita	EPA	Divita.sonny@epa.gov
Zach Jelenek	USACE	zachary.d.jelenek@usace.army.mil
Beth Mead-O'Brien	EGLE	obriene1@michigan.gov
Barb Vetort	EGLE	vetortb@michigan.gov
Traven Michaels	LTBBOI	tmichaels@ltbbodawa-nsn.gov

Purpose and Background

This field inspection was conducted to support the fifth five-year review (FYR) for the PMC Groundwater Superfund Site (Site). FYR inspections are conducted in accordance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP)(40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy. The current remedy for the Site is monitored natural attenuation (MNA) to address volatile organic compounds (VOCs) in groundwater. A vapor intrusion (VI) issue was identified in 2017 that prompted a removal action at the Site and a total of 18 individual sub-slab depressurization systems (SSDS) were installed at the Site. Currently these systems are being maintained and monitored by Michigan EGLE.

To address the VI problems, an Interim Record of Decision (ROD) was issued in 2022 which includes Air Sparge (AS) and soil vapor extraction (AS/SVE) beneath the current condominiums that were built on the source materials with installation of vapor intrusion mitigation systems (VIMS) at buildings surrounding the source area that pose a current or future risk from inhalation of vapors. The 2022 Interim ROD has not been implemented and is currently at the remedial design (RD) phase therefore, the inspection focused on the existing monitoring wells and a check on one of the SSDS currently being maintained by EGLE. To minimize disturbance to property owners, only one SSDS was inspected because EGLE was scheduled to conduct their annual sampling and inspection in mid-August 2024. EGLE agreed to inspect all SSDS (already a part of their scope of activities) and provide EPA with a short write up or provide the

documentation of their activities. Monitoring well and soil gas well locations are presented on Figure 1 at the end of this report.

Summary

I arrived at the Site at 7:30am on July 30th to begin the FYR Site inspection. A representative from EPA Region 5's Field Services Section (FSS), Divita, was onsite to perform downhole camera assessment at all existing monitoring wells. Michigan EGLE's project manager (Mead-O'Brien) and geologist (Vetort) were onsite to observe Site conditions and downhole camera activities. The USACE Technical Lead for the Site's RD, Zach Jelenek, attended the inspection on Day 1. Later in the day, Traven Michaels from the Little Traverse Bay Band of Odawa Indians came for a portion of Day 1 and Day 2 of the inspection activities. Once everyone gathered, I provided an overview of the activities that would be conducted at the Site and Divita began setting up the camera for the first monitoring well. Although Divita brought a metal detector to locate wells in Bay Front Park, it was not functioning and therefore the team began locating as many wells as possible based on the map and probing with a screwdriver and shovel. The team was able to locate all of the wells in Bay Font Park even though they were completely sodded over. We were able to complete the downhole camera of 19 wells on the first day.

Day 2 of the inspection I arrived at the Site at 7:30am to complete the camera assessment of remaining wells with Divita and Mead-O'Brien. Two monitoring wells, CMW1 and CMW2, that were located on the source area parking lot could not be opened because it appeared to have been sealed shut from resurfacing of the parking lot. Additionally, two monitoring wells (PS-1R and PS-13) located on private property were not inspected due to denial of access from the property owner. A total of 22 of the 26 monitoring wells were inspected. My notes on each well condition are presented on Table 1 attached to this report. FSS submitted a report of the well analysis with pictures of the downhole camera and is attached to this report.

In summary, all of the monitoring wells at the Site will need redevelopment prior to sampling and all well caps will need to be replaced. A few of the wells as outlined in the FSS report may need to be abandoned and replaced due to the well being bent or possible damage in the well screen.

After completion of the well inspections, we began locating and inspecting the multi-depth soil gas wells. Some of the soil gas wells on the source parking lot were able to be opened however, two soil gas wells in the parking lot were sealed shut and could not be inspected. One soil gas well located in the driveway of a private property was also sealed and could not be opened due to concrete surrounding the opening of the well (see Photograph 8). A total of 12 of the 15 soil gas wells were inspected. Notes on each soil gas well condition is attached to Table 2 of this report. All soil gas wells inspected, with the exception of one, appeared to be in usable condition. One well was filled with bentonite that expanded in the well casing. I tried to remove as much as possible, but it will need to be thoroughly clean (if possible) or replaced (see Photograph 5).

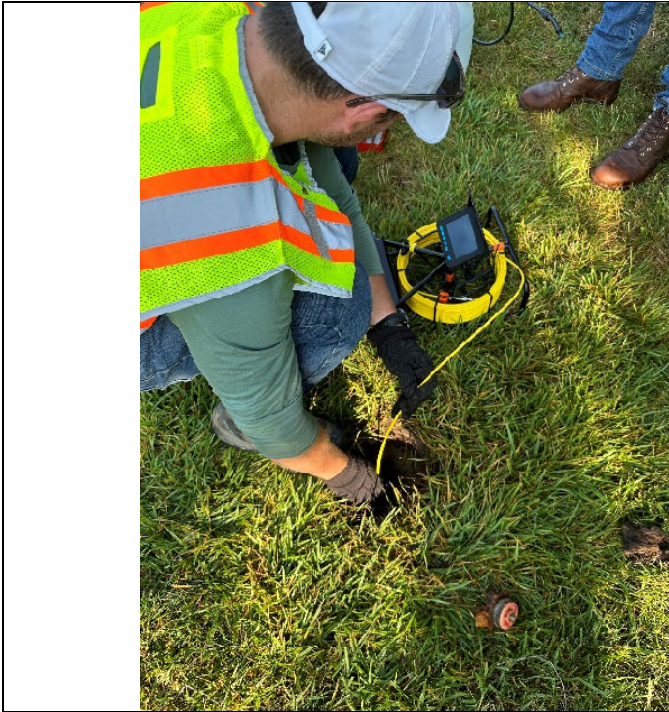
During the soil gas well inspection, we met with the Water Street Condominium property manager to assess one of the SSDS in the condos (Unit 9). The system showed it was running and pulling air from the suction points. Photographs of the system were taken (see Photographs 6-7).

Day 3, EGLE PM and I met with the Sunset Shores Condominium board president at 8am to look at the crawl space beneath one of the buildings. I was recently told by the condo president that the crawl space has been sealed due to the moldy and musty smell that would emanate from the crawn space into the common areas. Previous documentation and reports from EGLE stated that the crawl space was open to the ground. EGLE and I took pictures and noted the plastic material was thicker than a typical poly plastic sheeting (maybe 1/8th inch) with multiple layers which was taped together with what appeared to be heavy duty duct tape (see Photographs 9-11). I did not note any musty or moldy smells, so it appears that the sealing is functioning for its intended purpose. There were also dehumidifiers running in the crawl space.

Photographs

I took photographs of the site. The monitoring wells and soil gas wells were photographed as well as anything of note to document at the Site (Sunset Shores Condominium crawl space and SSDS). The photographs were taken using my iPhone 14 because an agency camera was not available at the time of the inspection. The photographs obtained are stored in the Site files on my OneDrive and a subset of photographs are provided below in the report.

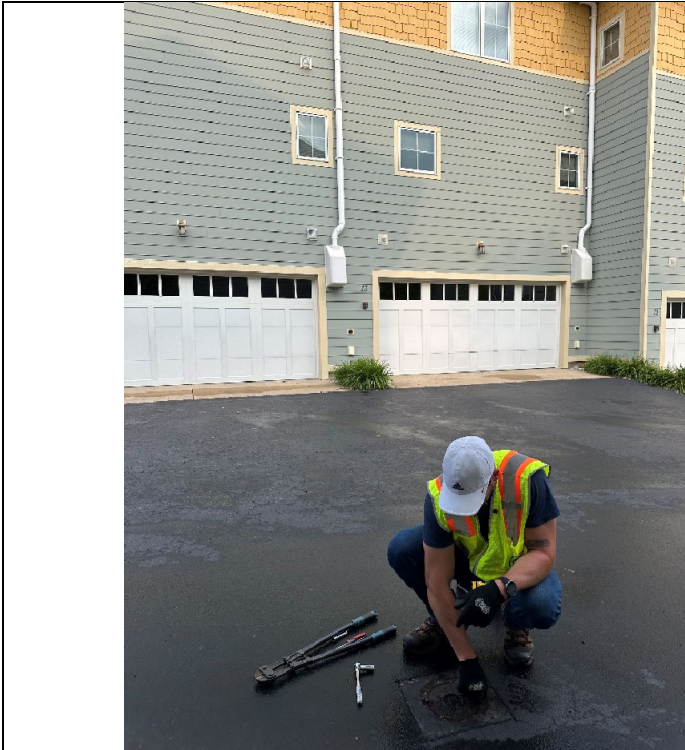
	<p>Photograph #: 1 File Name: IMG_2108.jpg Date: 7/30/2024 Photographer: Cheryl Kondreck Location: Well MW-401 set Subject: FSS team, Sonny Divita Preparing down-hole well inspection.</p>
---	---



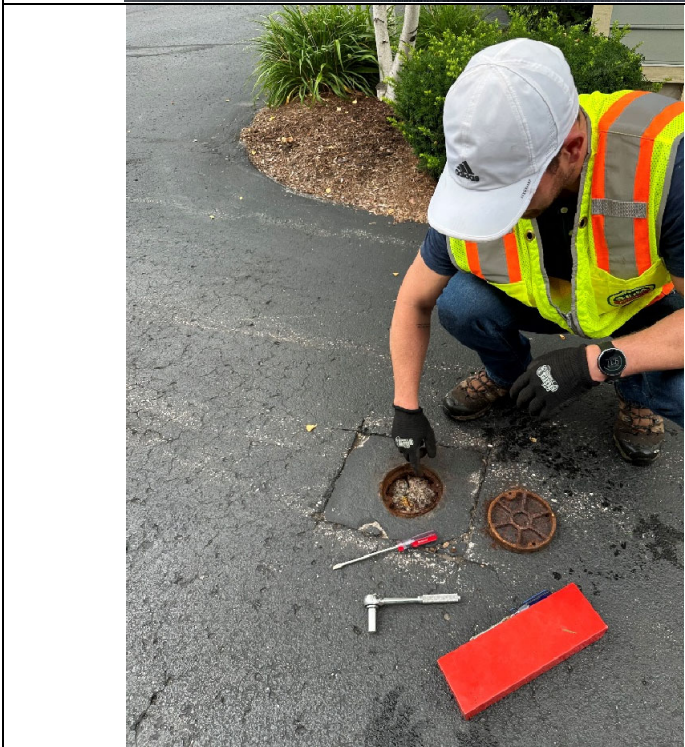
Photograph #: 2
File Name: IMG_2111.jpg
Date: 7/30/2024
Photographer: Cheryl Kondreck
Location: Well COP-1
Subject: FSS team, Sonny Divita conducting down-hole well inspection.



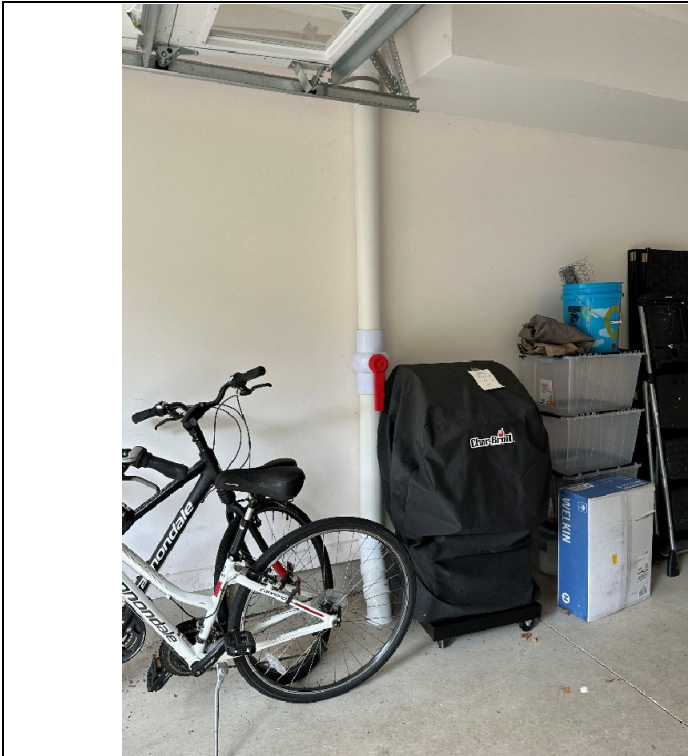
Photograph #: 3
File Name: IMG_2135.jpg
Date: 7/31/2024
Photographer: Cheryl Kondreck
Location: PS-10A
Subject: One of three stick-up wells at the Site



Photograph #: 4
File Name: IMG_2137.jpg
Date: 7/31/2024
Photographer: Cheryl Kondreck
Location: CMW-01
Subject: Well cover was “sealed” due to resurfacing of the parking lot at 200 W Lake St.



Photograph #: 5
File Name: IMG_2152.jpg
Date: 7/31/2024
Photographer: Cheryl Kondreck
Location: SVB-15
Subject: This soil gas well was filled with bentonite however, the soil gas sample tubing was still present and capped.



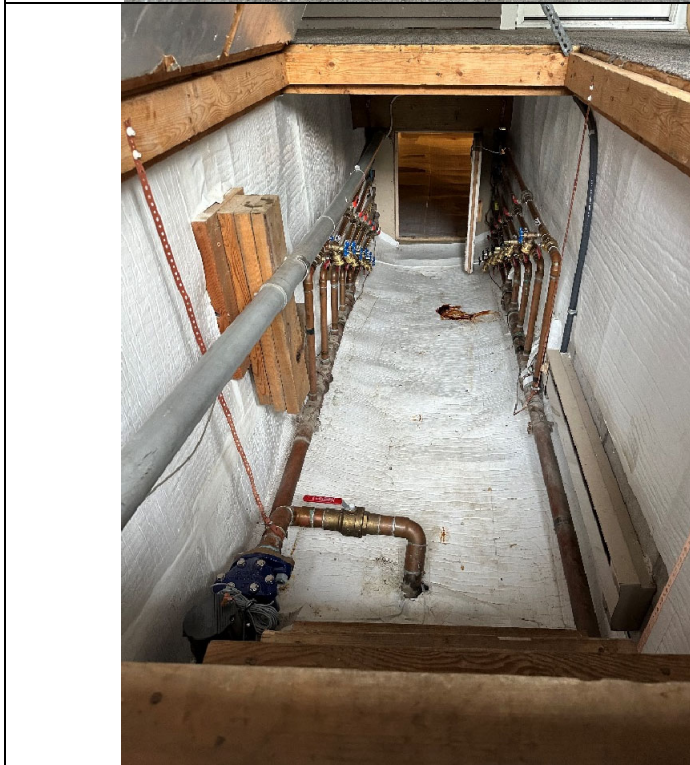
Photograph #: 6
File Name: IMG_2150.jpg
Date: 7/31/2024
Photographer: Cheryl Kondreck
Location: Inside garage of condo unit
Subject: Example SSDS suction point





Photograph #: 7
File Name: IMG_2151.jpg
Date: 7/31/2024
Photographer: Cheryl Kondreck
Location: Northern end of the WSC building
Subject: SSDS fan and exhaust above the roofline



Photograph #: 8
File Name: IMG_2164.jpg
Date: 7/31/2024
Photographer: Cheryl Kondreck
Location: SVB-01
Subject: Soil Gas well sealed to the driveway concrete



Photograph #: 9
File Name: IMG_2173.jpg
Date: 8/1/2024
Photographer: Cheryl Kondreck
Location: Sunset Shores Condominiums
Subject: Entrance to crawl space sealed by the Condominium association

	<p>Photograph #: 10 File Name: IMG_2169.jpg Date: 8/1/2024 Photographer: Cheryl Kondreck Location: Sunset Shores Condominiums Subject: Crawl space sealed by the Condominium association</p>
	<p>Photograph #: 11 File Name: IMG_2174.jpg Date: 8/1/2024 Photographer: Cheryl Kondreck Location: Sunset Shores Condominiums Subject: Up close view of plastic sheeting material used.</p>

Closing

The FYR inspection conducted from July 30th through August 1, 2024 showed that all wells onsite need redevelopment, new well caps, and further inspection after the redevelopment is completed. The inspection report from FSS suggested three wells be abandoned and would need to be replaced. It is also recommended that all wells be inspected again with a downhole camera after redevelopment. Most of the multi-depth soil gas samples points were in-tact with steel caps on the tubing to ensure no water getting into the tubing. Only two sets that were inspected were questionable on whether they needed to be replaced; one well set due to the bentonite completely covering the tubing and the other wells set was submerged under water within the well’s outer casing.

Figure 1: Monitoring well and soil gas well locations.

Table 1: Monitoring well inspection notes

Table 2: Soil gas well inspection notes

Attachment 1: Well Integrity Survey Report, PMC Groundwater Site (0554FE), Petoskey, MI
Survey Date: July 30-31, 2024

Signatures

Report Author

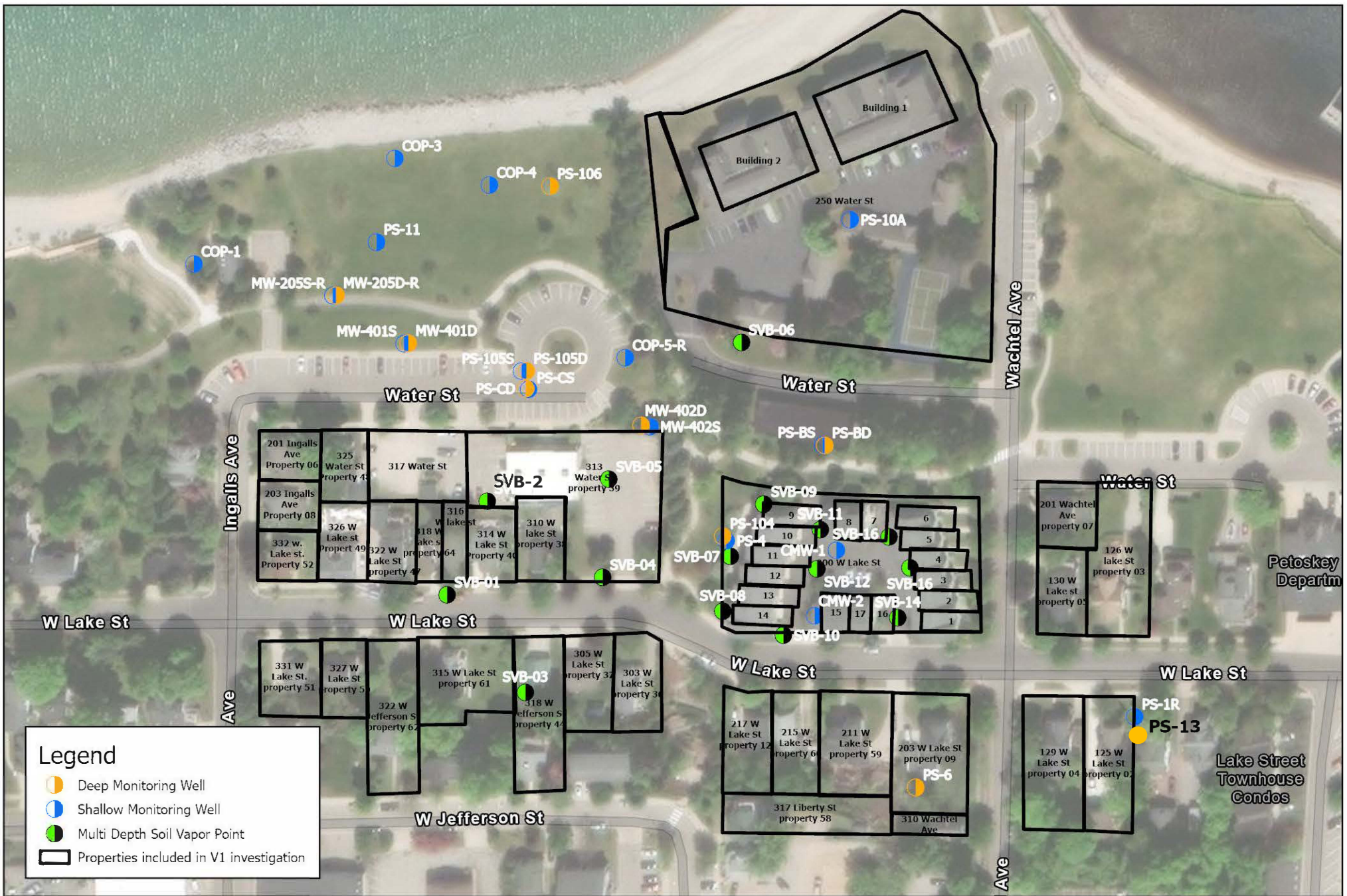
Cheryl Kondreck, P.G.
Remedial Project Manager
Remedial Response Branch 1, Section 1

Date

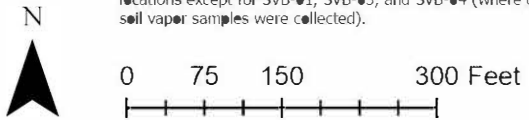
Reviewer

Michael Beedle
Remedial Response Section 1 Supervisor
Remedial Response Branch 1, Section 1

Date



Note:
 1. Soil and/or groundwater grab samples were taken at all SVB- and CMW-locations except for SVB-01, SVB-03, and SVB-04 (where only exterior soil vapor samples were collected).



**Sample Location Map + Properties Included in the Vapor Intrusion Investigation
 Petoskey, Michigan**
 Map by EPA R5 Fields Team 7/23/24



PMC Groundwater Superfund Site, Emmet County, Petoskey, Michigan

ID	Well Depth	TOC Elevation (feet) ^a	DTW (ft bgs) 6/1/2018	Well Cap	Need repair?	Camera Results	Notes (General note: all wells need new well plugs)
CMW-1	20	592.98	12.15			Well sealed and could not be inspected	Looks like the parking lot asphalt re-sealing completed with tar coating the well cover. Could not be opened.
CMW-2	26	594.72	13.88			Well sealed and could not be inspected	
COP-1	26.52	588.85	8.01	x	N	Steel looks mishapen but screen is clean	
COP-3	8.8	585.91	5.1	x		Some odd grasslike material in the well	
COP-4	10.35	587.31	6.5	x	N	No silt - well looks in good condition	
COP-5-R	15.08	591.45	10.6	x		Well not centering in the outer casing. Sediment buildup along the screen	
MW-205D-R	60.6	588.17	7.25	x		Silty however well screen in good condition	
MW-205S-R	15.05	588.33	7.55	x		Very silt well	
MW-401D	40.5	593.75	12.9	x	N	Buildup in the well and needs redevelopment	
MW-401S	23.55	593.64	12.8	x	N	Some buildup of sediment, needs redevelopment	
MW-402D	20.7	591.45	10.54	x		Very silty and mucky, cannot see the screen	Confirmation on well depths needed at this well pair
MW-402S	39.6	590.99	10.09	x		Looks clear	
PS-104	42.07	593.65	12.8	x		Silty and hard to see screen condition	
PS-4	21.13	593.89	12.99	x		Screen is visible but is bent - most likely occurring during installation of the well	Will need to be replace due to bent screen
PS-105D	77.8	591.66	11.01	x		Camera malfunctioned before getting to depth of the screen. Water up to the point was clear	Confirmation on well depths needed at this well pair (one well located beneath bush)
PS-105S	34.55	591.90	8.305	x		Obstruction in the well and could not see the screen; not too rusty	
PS-CD	41	592.45	11.6	x	Y	Silty screen	Well cover is not bolted
PS-CS	18	592.47	11.62	x	N	Some particulated and sediment but well screen looks good	
PS-106	40.27	589.45	8.5	x		Some calcium buildup	
PS-10A	25.9	589.31	8.63	x		Some buildup on screen	Stickup well. Well lock needed to be cut and new one put on the lock.
PS-11	30.04	585.99	5.14	x	Y	May need replacement - 1 ft into the well and is totally silted and not visible	
PS-13	37.65	595.70	14.83			access denied by owner	Owner indicated the well was gone however, both wells are stick-up wells that can clearly be seen in the front of the home.
PS-1-R	42.07	595.59	14.78			access denied by owner	

PMC Groundwater Superfund Site, Emmet County, Petoskey, Michigan

ID	Well Depth	TOC Elevation (feet) ^a	DTW (ft bgs) 6/1/2018	Well Cap	Need repair?	Camera Results	Notes (General note: all wells need new well plugs)
PS-6	26	598.34	-		Y	Bugs inside well at the water table (worm-like) Well is very silty and cannot see screen	1" well located in the backyard of private property
PS-BD	44.3	591.00	10.18	x		Very silt with material/sediement	
PS-BS	17	591.02	10.21	x		Screen in good condistion but very silty, little rust on the screen	

^a=we;;s where down-hole camera inspection not conducted

PMC Groundwater Superfund Site, Emmet County, Petoskey, Michigan

ID	Well Depth	Tubing Cap	Need repair?	Notes (all bolts are 7/16" and should replace all)
SVB-01	6			Well still there but new driveway installed and rim of well has concrete, could not open at this time.
	14			
SVB-02	6	x	Maybe?	Water in outer casing but may still be usable. Bolts are broken
	11	x	Maybe?	
SVB-03	5.5	x	N	Usable - marked with colored tape - bolts are good
	10.5	x	N	
	15	x	N	
SVB-04	6	x	N	Usable - need to replace bolts
	9	x	N	
	12.5	x	N	
SVB-05	4.5	x	N	Usable - need to replace bolts
	10.5	x	N	
SVB-06	6	x	N	Usable - need to replace bolts
SVB-07	5.5	x	N	Usable - marked with colored tape - bolts are good
	12	x	N	
SVB-08	7	x	N	Well filled with drilling sand to top of cap - looks usable - need to replace bolts
SVB-09	6	x	N	Outer casing for well filled with concrete - tubing marked with color tape
	10	x	N	
SVB-10	6	x	N	Usable - marked with colored tape - need to replace bolts
	10	x	N	
	15.6	x	N	
SVB-11	5			Sealed shut due to asphalt re-sealing
	10			
SVB-12	5			Sealed shut due to asphalt re-sealing
	12			
SVB-14	4.8			Bolts were stripped and could not remove the well cap.
	9.5			
	12.5			
SVB-15	4.8	x	Maybe?	This well was filled with bentonite that expanded. Did best to remove the bentonite but not sure if it's usable. Didn't inspect the tubing because was
	10	x	Maybe?	
SVB-16	9	x	N	Usable

Well Integrity Survey Report

PMC Groundwater Site (0554FE)

Petoskey, MI

Survey Date: July 30-31, 2024



Sonny Divita

Superfund and Emergency Management Division

Field Services Section

Region 05 – Chicago, IL

Introduction

At the request of Remedial Project Manager (RPM) Cheryl Kondreck, a well integrity survey was completed at the PMC Groundwater Site in Petoskey, Michigan between the dates of July 30-31, 2024. The purpose of the survey was two-fold: First, find historic wells that may have been hidden due to non-use for several years, and second to visually inspect the wells to find obvious integrity issues such as no visible screens, bent or cracked casing, blockages, or well cap issues. This survey was not intended to be a well logging survey and therefore well measurements such as total depth, depth to screen, depth to groundwater were not recorded. The site management team will assess the results of the survey to determine if wells should be abandoned or cleaned and re-developed for future sampling. It is at that point that a more thorough well logging event could be more useful.

Staff

The camera was operated by Sonny Divita from Field Services Section (FSS) USEPA. The RPM on-site was Cheryl Kondreck (USEPA). Several others including Zach Jelenek (USACE), Beth Mead-O'Brien (EGLE), Barb Vetort (EGLE), and Traven Michael (LTBBOI) helped in finding wells, describing their knowledge of the site, and assisting in taking notes.

Equipment

The requirements of this survey to quickly visually inspect the wells led to the decision to use a basic Vevor downhole plumbing camera with a 120 degree lens, LED lights, a portable small monitor, and approximately 94 ft. of waterproof cable. This type of arrangement only costs a few hundred dollars and can be used quickly to visually inspect joints, screens, and overall well condition. However, more advanced equipment that ranges into the tens of thousands of dollars typically come with additional capabilities such as automatic camera centering, depth measurements, audio recording, groundwater sensors, and also typically provide much better camera clarity. If a more thorough investigation is warranted in the future it may be beneficial to rent or acquire a more advanced camera system.

A EM61-HH wheel mounted time domain electromagnetic instrument was to be used to help find hidden well covers; however, the battery pack malfunctioned. While attempting to fix the battery pack, the well covers were found by the other colleagues on-site simply by probing the ground near the known coordinates. The EM61-HH was not used.

Limitations

The equipment used at the site was bought with the intention of using it as a pilot study to understand possible future needs for SEMD well integrity surveys. Limitations were expected. The most obvious limitation of the equipment was no automatic centering and thus the camera tended to follow one side

of the casing all the way down, which is evident in most of the photos. The second limitation was that after several wells the clarity of the camera noticeably decreased. Even after thorough cleansing, the quality was never as it was out of the box. There was also one instance of the camera cutting out completely at a depth of around 60 ft on well PS-105D. After taking the camera apart it appeared that water may have gotten through a gasket that protected the electrodes. After drying the electrodes off the camera did not cut out again, but there was a resolution decrease. All in all the camera provided adequate, though not impressive, visuals of the wells and was enough to make a determination as to whether the wells may be salvageable or not.

Results

Twenty-two wells were surveyed in total. Many of the wells viewed at the site were in relatively good condition considering many have not been touched in over a decade. All of the wells appeared to be constructed of steel and no major features like large dents, holes, or leaking joints were seen. The most prevalent characteristics of the wells were rust buildup, calcium buildup, and silty screens. Most of these issues can be addressed with well scrubbing, purging, and re-development.

13 Wells were noted in good enough condition for possible cleaning and re-development include:

COP-1, COP-4, COP-5R, MW-205D-R, MW-205S-R, MW401S, MW-402S, PS-104, PS-CD, PS-CS, PS-10A, PS-BD, and PS-BS.

9 Wells were noted to have at least one issue and include:

Well PS-11 had a visible screen but the camera only went down a couple of feet prior to a sand bottom. It may be worth trying to purge the well to see if the sand clears. Possibly salvageable.

Well PS-106 had some noticeable calcite buildup around the screen that can be seen as a white color in the photo log. May still be salvageable.

Well PS-4 appeared to have a large bend in the screen that can be seen in the photo log and the camera could not make it past the bend. It was likely caused during installation.

Well PS-105S had no visible screen, however, the camera was sent down to the recorded historical depth. It's possible the screen was silted up or that the water in the well was too turbid to see the screen. May be salvageable.

Well PS-105D the camera cut out at approximately 60 ft due to water bypassing a gasket and interfering with the electrodes. Well was in good condition to that point.

Well PS-6 had no visible screen; however, the well also did not have a well cap on it.

Well MW401D had no visible screen, however, the camera was sent down to the recorded historical depth. May be salvageable.

Well COP3 had an interesting rust feature near the top of well that looked like a hole, however, no fluid was seen pouring in. May be an abandonment candidate.

Well MW402D had very low visibility due to such high turbidity. The camera was sent the depth of the well, but nothing could be seen through the suspended sediment. Suggest purging and re-examining. Possibly salvageable.

4 Wells were not surveyed and include PS-13/PS-1-R (No Access), and CMW-1/2 (Not accessible due to being sealed over by asphalt sealing)

Photo Log

A photo log is included of all the pictures taken during the survey. It is evident that the camera was off-center for most pictures as described above. Also, the change in clarity can be noticed between wells. Some wells contained so much turbidity that there is almost no resolution; however, those photos are included regardless. The primary features photographed for all wells include the casing stick out, joints (when visible), rust, foreign objects, water table (seems as LED light reflection), screens, and the bottom of well (when visible).

Photo Log List and summary

Well ID	Photos	Condition
MW-401D	1-8	No visible screen, but may be worth purging
MW-401S	9-18	Good enough condition to try cleaning and re-development
COP-1	19-26	Good enough condition to try cleaning and re-development
COP-5-R	27-34	Good enough condition to try cleaning and re-development
PS-CD	35-46	Good enough condition to try cleaning and re-development
PS-105S	47-53	No visible screen, but may be worth purging
PS-105D	54-57	Camera cut out, but was in good condition to that point
PS-106	58-65	Calcite buildup, but may be salvageable
COP-4	66-69	Good enough condition to try cleaning and re-development
COP-3	70-83	Possible hole from rusting, may be worth abandoning
PS-11	84-91	Sand bottom after a couple of feet, but may be worth purging
MW-205D-R	92-101	Good enough condition to try cleaning and re-development
MW-205S-R	102-108	Good enough condition to try cleaning and re-development
MW-402S	109-116	Good enough condition to try cleaning and re-development
MW-402D	117-123	Extremely high turbidity, suggest purging and re-examining
PS-6	124-130	No visible screen, no well cap, suggest abandonment
PS-BD	131-134	Good enough condition to try cleaning and re-development
PS-BS	135-139	Good enough condition to try cleaning and re-development
PS-104	140-145	Good enough condition to try cleaning and re-development
PS-4	146-152	Bent screen, suggest abandonment
PS-CS	153-159	Good enough condition to try cleaning and re-development
PS-10A	160-166	Good enough condition to try cleaning and re-development

Conclusions

The equipment used for this survey was adequate to visualize the major features of the wells and assess their overall condition; however, it is suggested that after wells are cleaned and re-developed a more advanced downhole logging camera be used to obtain more accurate photos and depths. Overall, it can be determined that 16 of the wells that were screened were in good enough condition to warrant cleaning and re-development. Wells PS-106, MW401D, PS11, COP3, MW402D, and PS-105D may still be salvagable and should be considered for cleaning and re-development prior to a follow-up camera survey. Wells PS-105S may be salvageable since the camera went down the recorded depth but no screen was seen. It is recommended to attempt cleaning and re-development prior to a follow-up camera survey. Wells PS-4, COP-3, and PS-6 do not appear salvageable and are suggested to be abandoned. It is also noted that nearly every single well needs a new well cap replacement.

Appendix

Photo Log

1



MW401D – Casing in good condition

2



MW401D – Rusting around joint

3



MW401D – Water table

4



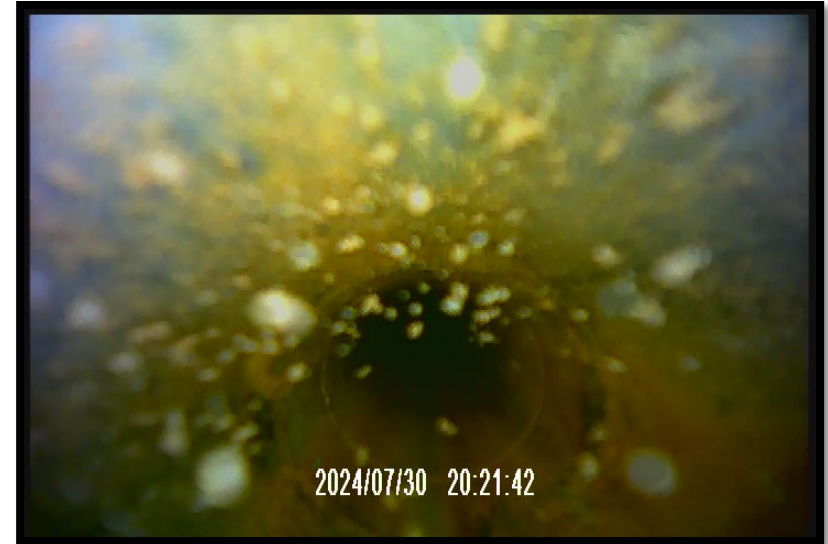
MW401D – Suspended sediment, reduced clarity

5



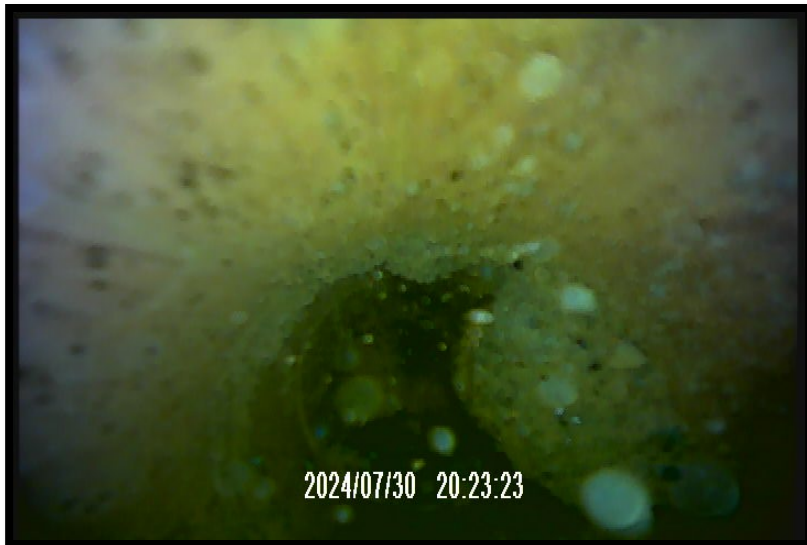
MW401D – sediment buildup around joint

6



MW401D – more suspended sediment

7



MW401D – well bottom

8



MW401D – well bottom

9



MW401S – well in the flush mount

10



MW401S - joint

11



MW401S - joint

12



MW401S – joint / water table

13



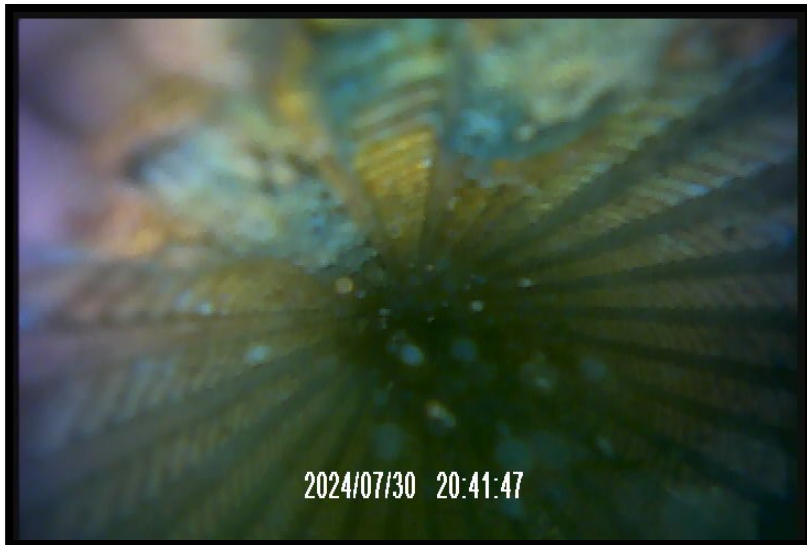
MW401S - joint

14



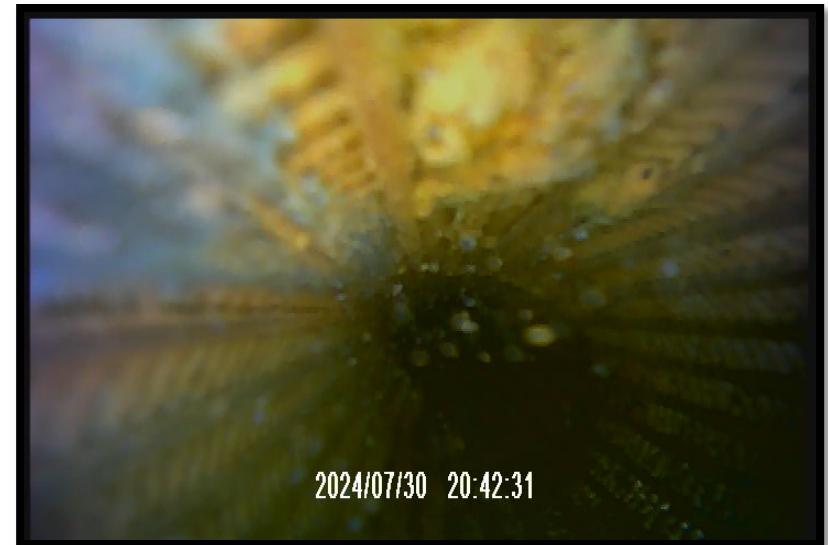
MW401S – some buildup around joint

15



MW401S – screen with some minor buildup

16



MW401S – bit of rust and buildup further down screen

17



2024/07/30 20:43:01

MW401S – additional buildup around screen

18



2024/07/30 20:43:13

MW401S – well bottom, turbid water

19



2024/07/30 20:55:49

COP1 – well cap in flush mount

20



2024/07/30 20:56:17

COP1 – well in flush mount

21



COP1 – casing and joint

22



COP1 – minor indentation in casing

23



COP1 – heavy rust above water table

24



COP1 – joint beneath water table

25



COP1 – top of screen

26



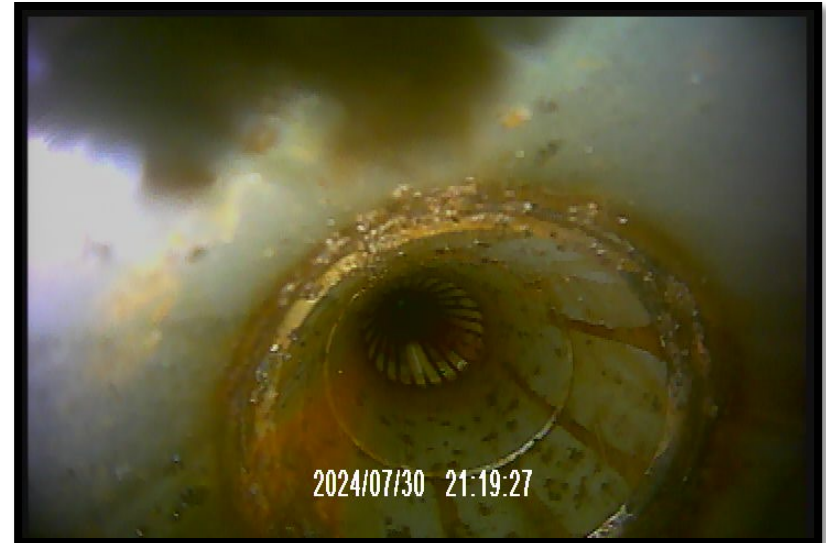
COP1 – bottom of well, clean screen

27



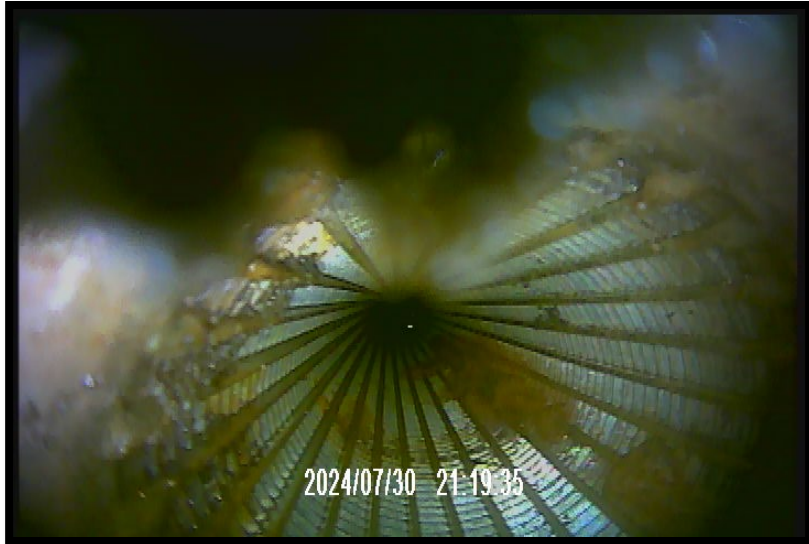
COP5R – well within flush mount

28



COP5R – rusty joint, and top of screen

29



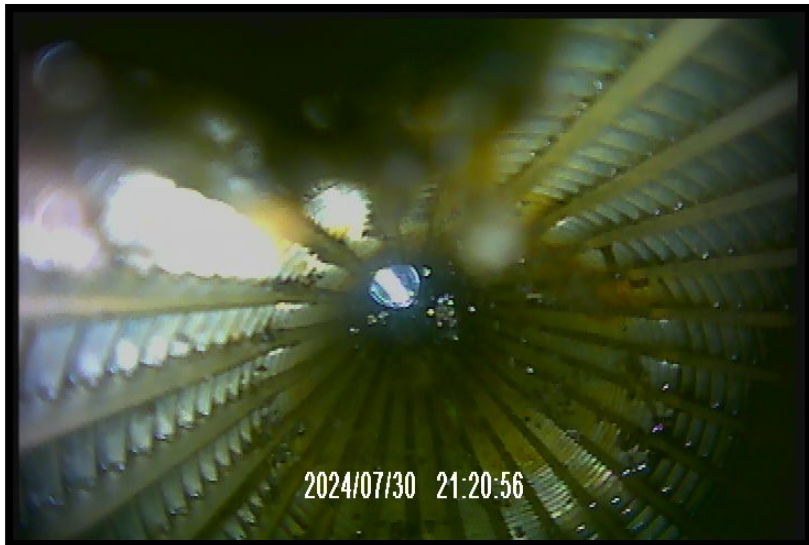
COP5R – some buildup near top of screen

30



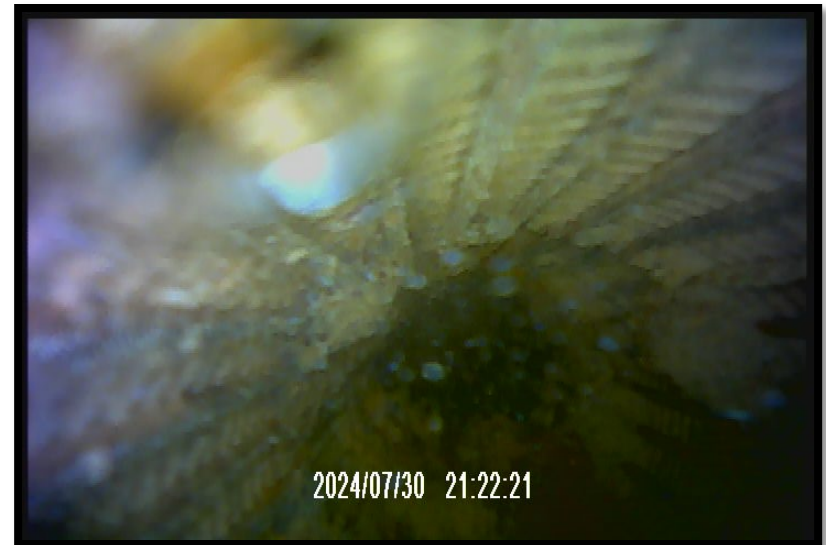
COP5R – little rust lower right side

31



COP5R – mostly clean screen

32



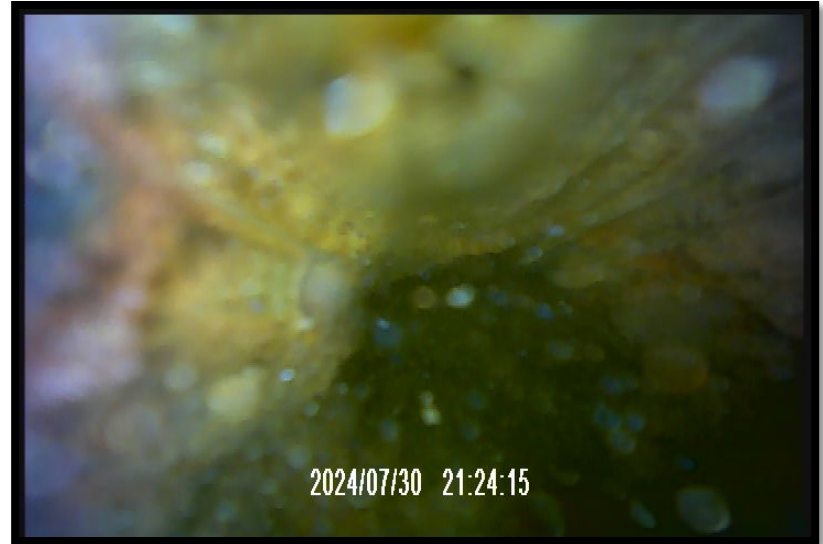
COP5R – bit of buildup further down

33



COP5R – sediment loosed from screen with camera

34



COP5R – additional suspended sediment near bottom

35



PSCD – Well within flush mount

36



PSCD - joint

37



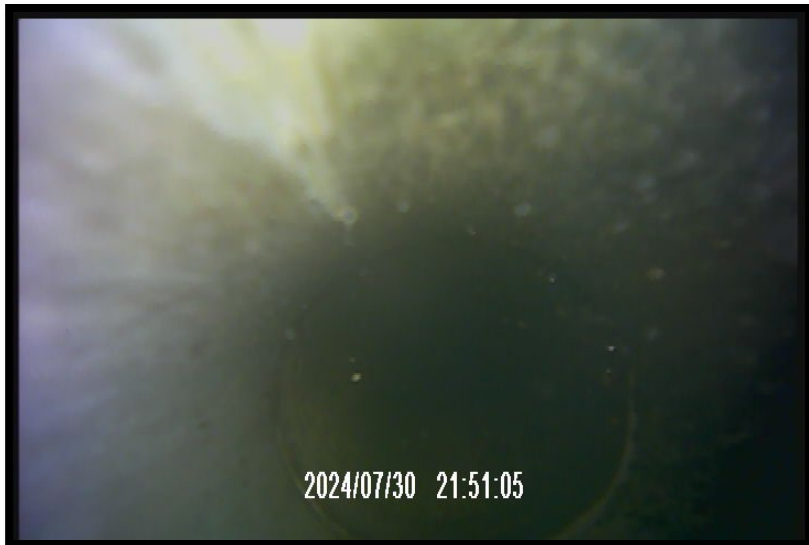
PSCD - joint

38



PSCD – water table

39



PSCD – reduced clarity, joint

40



PSCD – reduced clarity, joint

41



PSCD – camera along one side of well, joint

42



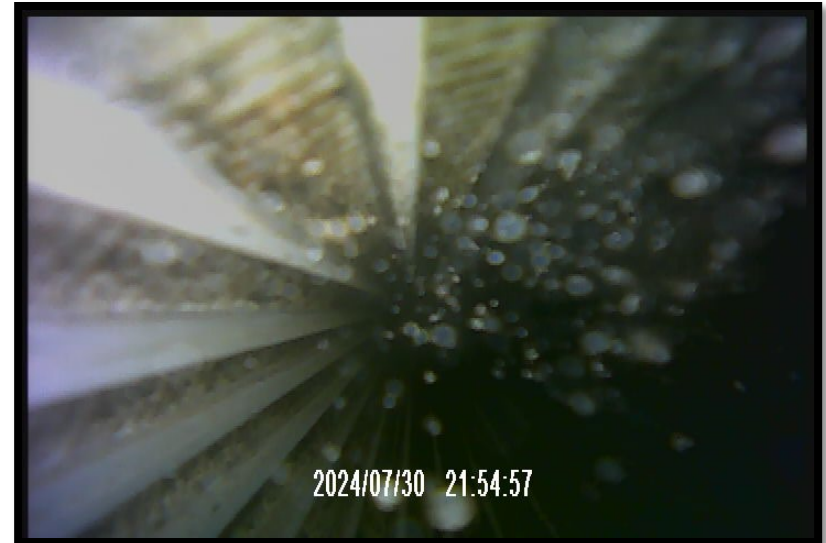
PSCD - camera along one side of well, joint

43



PSCD – screen has buildup near top

44



PSCD – screen a bit clearer further down

45



2024/07/30 21:55:08

PSCD – slight rust further down screen

46



2024/07/30 21:56:03

PSCD – well bottom, reduced clarity, poor angle

47



2024/07/30 22:12:06

PS105S – rusty well within flush mount

48



2024/07/30 22:12:15

PS105S – top of well, rusty

49



2024/07/30 22:12:56

PS105S – joint with rust

50



2024/07/30 22:13:43

PS105S – water table above rusty joint

51



2024/07/30 22:15:14

PS105S - joint

52



2024/07/30 22:16:37

PS105S – bottom, no obvious screen

53



2024/07/30 22:28:27

PS105D – well within flush mount

54



2024/07/30 22:30:29

PS105D – water table, some debris on top

55



2024/07/30 22:30:51

PS105D - joint

56



2024/07/30 22:31:53

PS105D - joint

57



PS105D – joint, camera cut out approx. 60 ft.

58



PS106 – well within flush mount

59



PS106 - joint

60



PS106 – water table, off center

61



2024/07/30 23:20:17

PS106 – piece of grass in well

62



2024/07/30 23:21:12

PS106 – reduced clarity, joint, top of screent

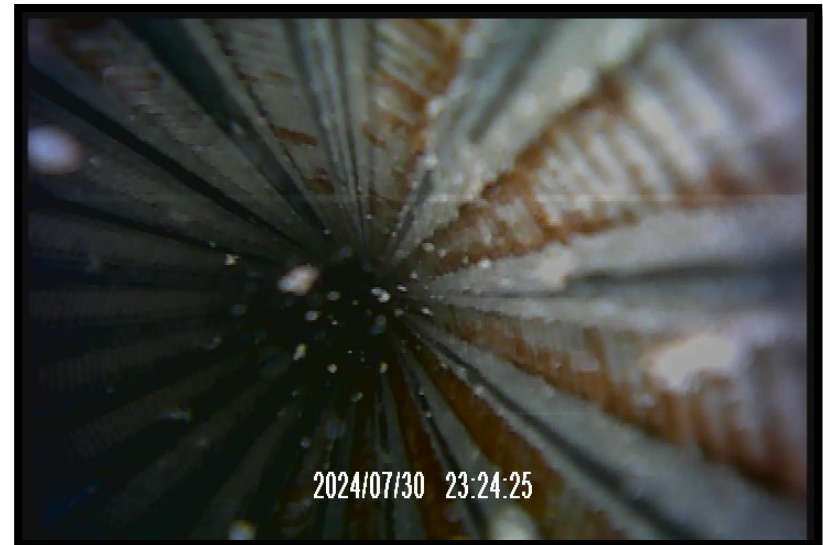
63



2024/07/30 23:23:37

PS106 – reduced clarity, screen

64



2024/07/30 23:24:25

PS106 – screen appears rusty with some white calcite buildup

65



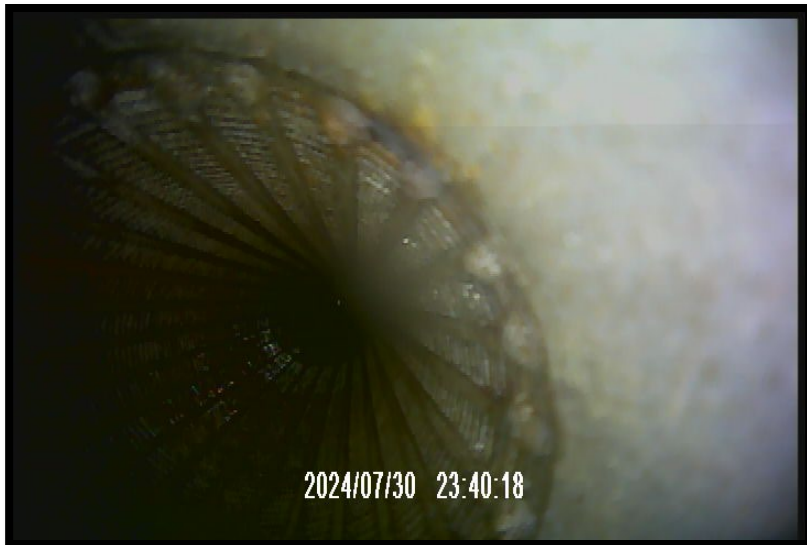
PS106 – bottom of screen, reduced clarity, calcite buildup still prevalent

66



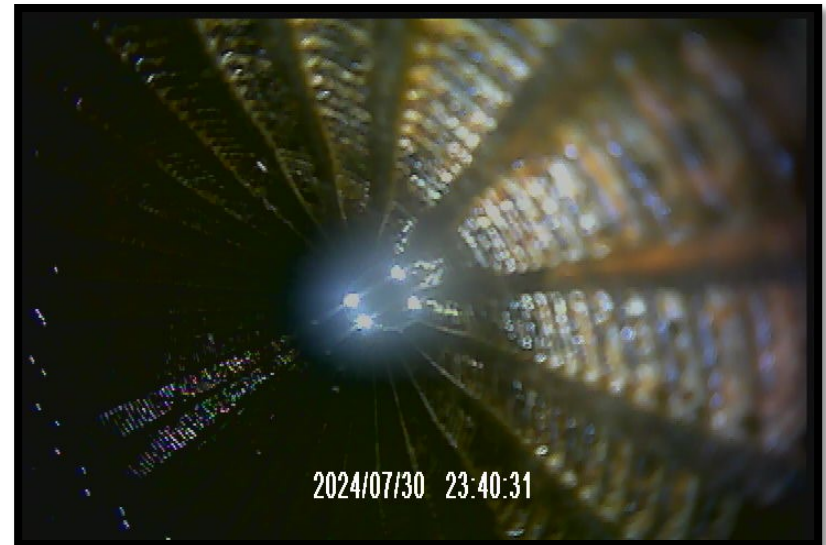
COP4 – well within flush mount

67



COP4 – top of screen

68



COP4 – reflection of water table within screen, some rust

69



COP4 – bottom of well

70



COP3 – well within flush mount

71



COP3 – rust feature that may be a hole

72



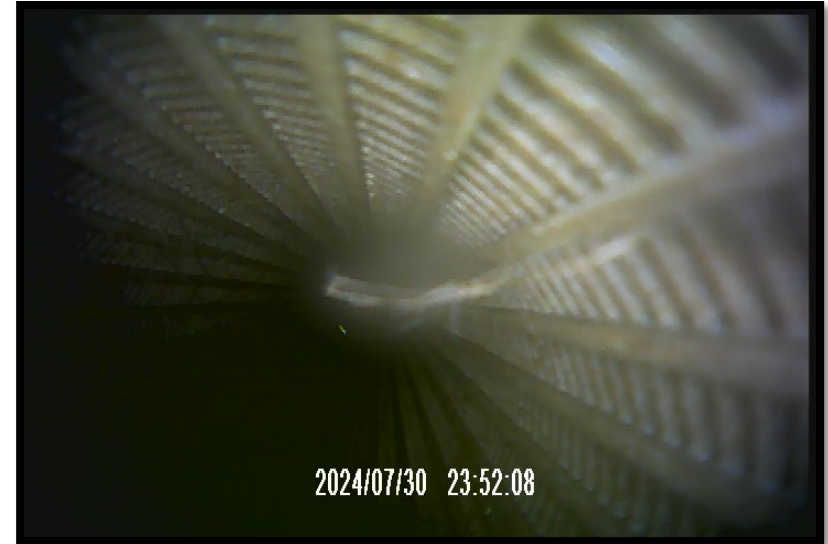
COP3 – heavy rusting above water table

73



COP3 – top of screen

74



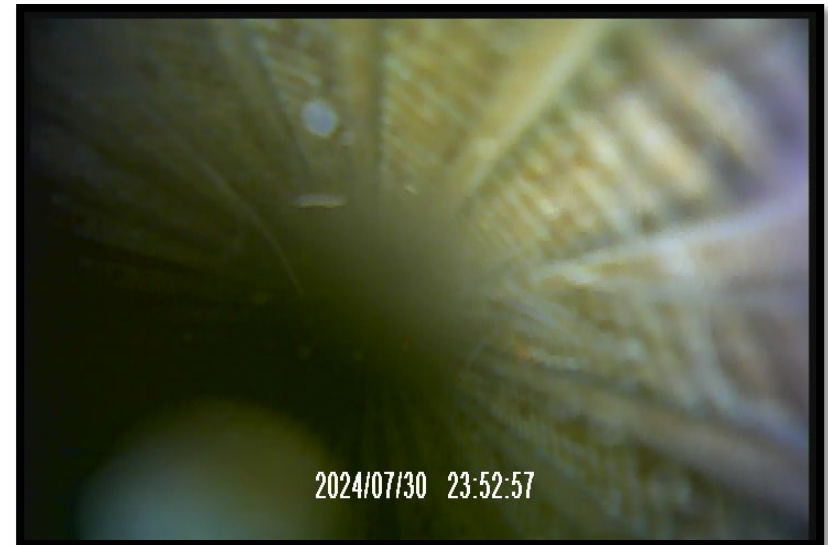
COP3 – screen in good condition

75



COP3 – possible roots getting into screen, water table reflection

76



COP3 – root like features seen beneath water table

77



2024/07/30 23:53:03

COP3 – additional roots

78



2024/07/30 23:53:16

COP3 – additional roots

79



2024/07/30 23:53:23

COP3 – additional roots

80



2024/07/30 23:53:28

COP3 – additional roots

81



COP3 – additional roots

82



COP3 – additional roots

83



COP3 – bottom of well

84



PS11 – well within flush mount

85



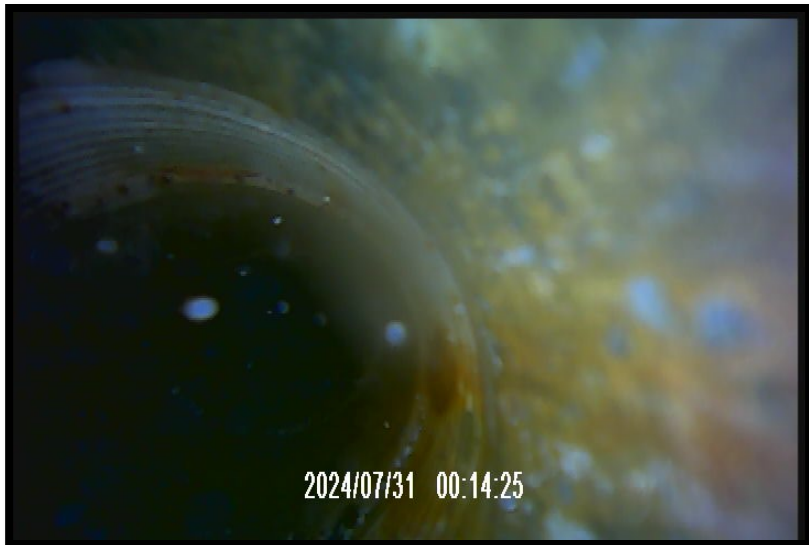
PS11 – water table reflection

86



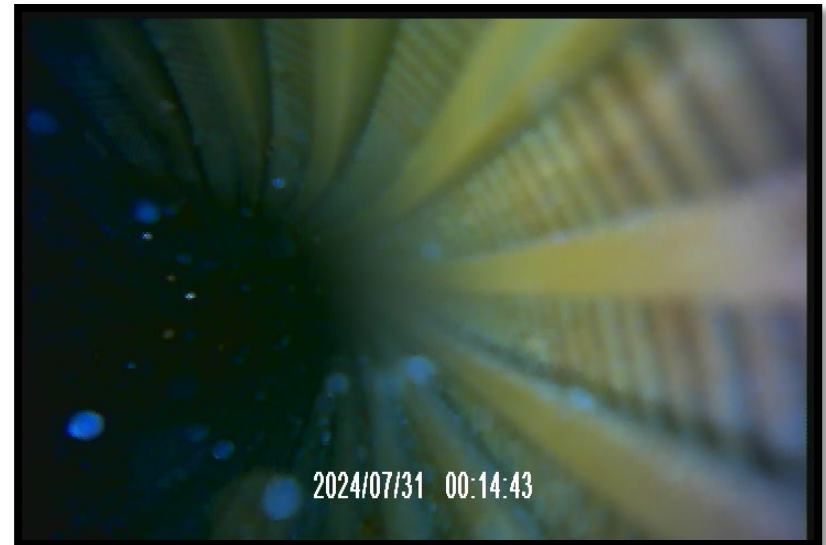
PS11 – camera off center, joint

87



PS11 – off center, joint above screen

88



PS11 - screen

89



PS11 – sand bottom after only a couple of feet

90



PS11 – additional screen photos on way back up

91



PS11 – additional screen photo on way back up

92



MW205DR – Well within flush mount

93



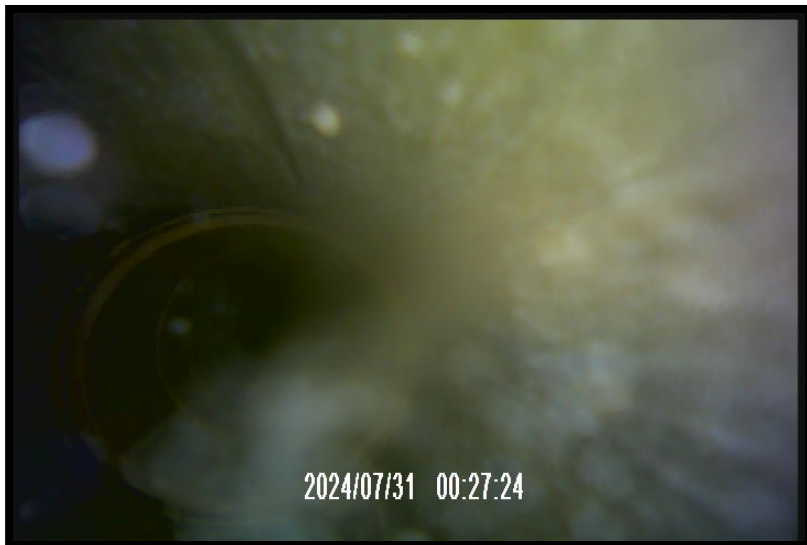
MW205DR – reflection off water table, reduced clarity

94



MW205DR – off center, joint below water table

95



MW205DR – sediment on camera, joint below water table

96



MW205DR - off center, joint below water table

97



2024/07/31 00:29:02

MW205DR – sediment on camera, joint below water

98



2024/07/31 00:30:00

MW205DR - joint

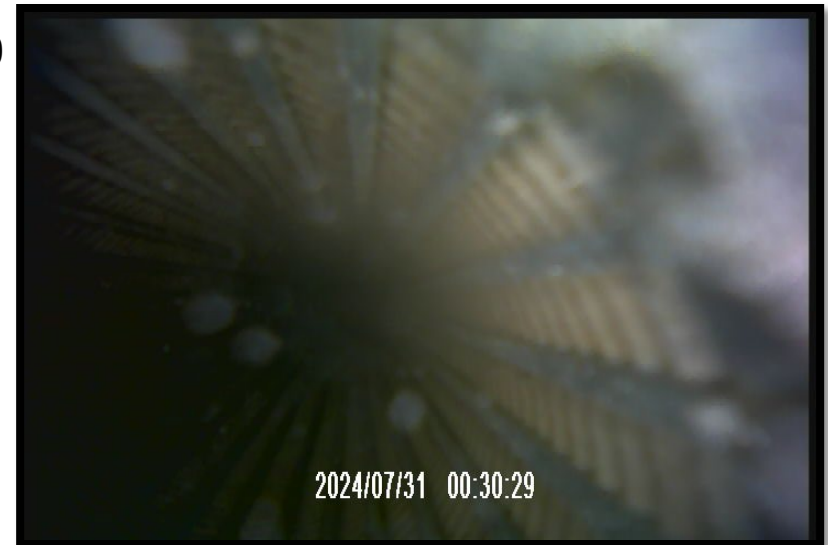
99



2024/07/31 00:30:22

MW205DR – joint above screen

100



2024/07/31 00:30:29

MW205DR – top of screen

101



MW205DR – Sediment being knocked off screen by camera, screen in good condition otherwise

102



MW205SR – well within flush mount

103



MW205SR – poor clarity, reflection off water table

104



MW205SR – poor visibility, joint

105



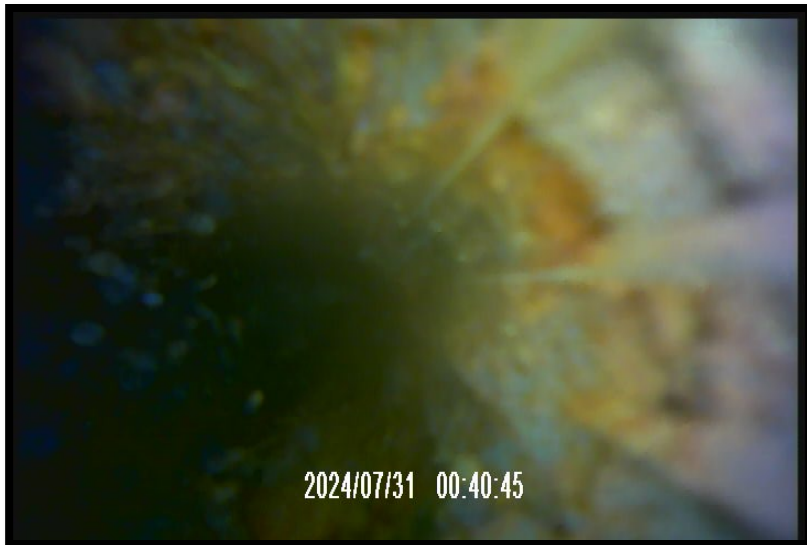
MW205SR – off center, top of screen in good condition

106



MW205SR – high turbidity further down

107



MW205SR – signs of rusting

108



MW205SR – high turbidity near bottom, reduced clarity

109



MW402S – well within flush mount

110



MW402S – poor clarity, joint

111



MW402S – reflection off water table

112



MW402S – some rusting on joint below water table

113



MW402S - joint

114



MW402S - joint

115



MW402S – some rust near top of screen

116



MW402S – screen in good condition

117



2024/07/31 01:55:56

MW402D – well within flush mount

118



2024/07/31 01:56:20

MW402D – joint in good condition

119



2024/07/31 01:56:35

MW402D – material on top of water table

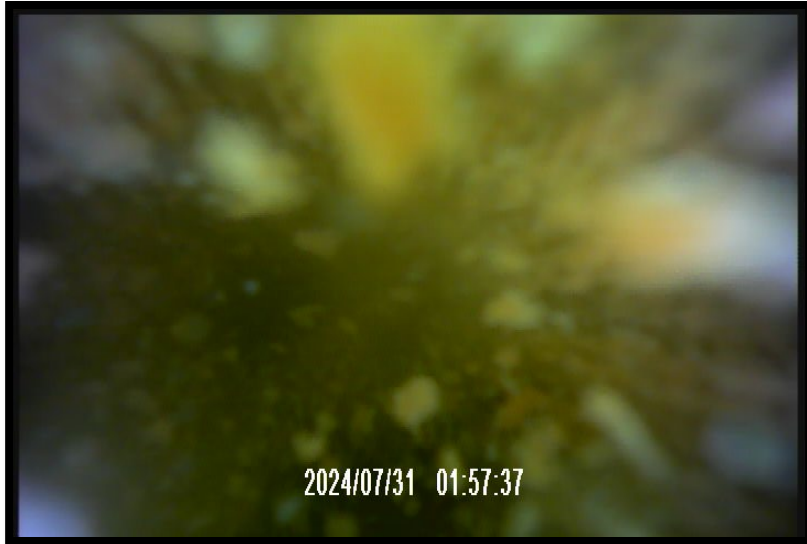
120



2024/07/31 01:57:36

MW402D – extremely high turbidity, low to no visibility

121



2024/07/31 01:57:37

MW402D – sediment load being disturbed by camera

122



2024/07/31 01:57:39

MW402D – low to no visibility

123



2024/07/31 01:58:51

MW402D – low to no visibility

124



2024/07/31 02:10:17

PS6 – well within flush mount, no cap when opened

125



PS6 - joint

126



PS6 – rusty joint

127



PS6 – rusty joint

128



PS6 – casing slight degraded

129



PS6 – buildup around a joint

130



PS6 – no clarity below joint, no visible screen

131



PSBD - well

132



PSBD – reflection off water table

133



PSBD – suspended sediment from camera drag, low visibility screen

134



PSBD – no visibility due to turbidity

135



PSBS – well within flush mount

136



PSBS – low visibility joint

137



PSBS – “film” on top of water table

138



PSBS – top of screen, off center

139



PSBS – screen appears lightly rusted and silty

140



PS104 – well within flush mount

141



2024/07/31 02:51:53

PS104 – reflection off water table

142



2024/07/31 02:52:12

PS104 – low clarity joint

143



2024/07/31 02:53:17

PS104 – low clarity joint

144



2024/07/31 02:54:20

PS104 – suspended sediment within screen

145



2024/07/31 02:54:57

PS104 – bottom of well, high turbidity

146



2024/07/31 03:01:21

PS4 – well within flush mount

147



2024/07/31 03:01:42

PS4 – poor visibility, casing/joint

148



2024/07/31 03:02:02

PS4 – reflection off water table

149



PS4 – rusting near joint

150



PS4 – top of screen

151



PS4 – clear bend in screen, camera could not pass

152



PS4 – bend in screen and build up along left side

153



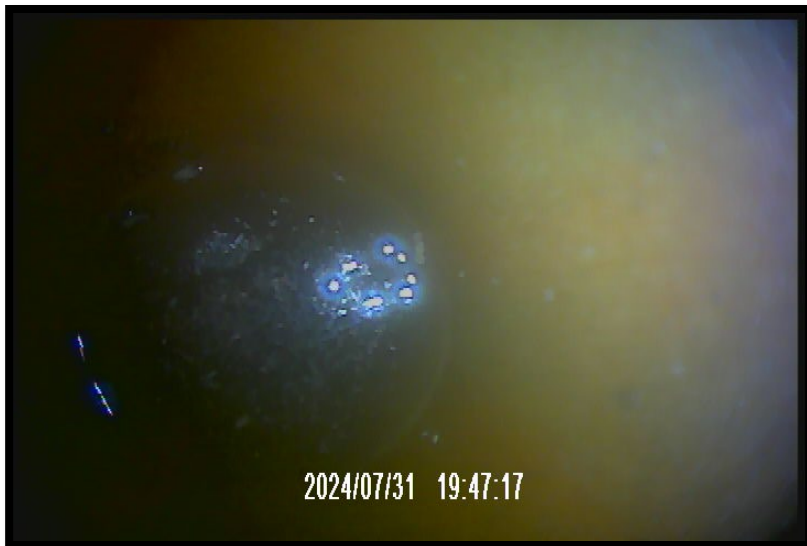
PSCS – well within flush mount

154



PSCS – very poor visibility, joint

155



PSCS – top of water table

156



PSCS – very poor visibility, joint

157



PSCS – high turbidity within screened interval

158



PSCS – high turbidity

159



PSCS – high turbidity, screen appears ok

160



PS10A – well within stick up, camera equipment

161



PS10A – rusty joint

162



PS10A – top of water table

163



PS10A – rusty joint

164



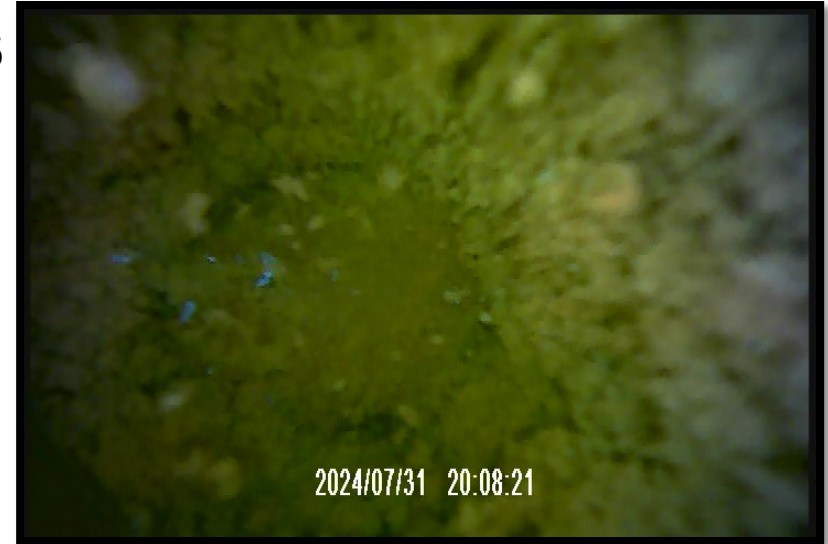
PS10A – off center, top of screen, rust

165



PS10A – sediment along screen loosened by camera drag

166



PS10A – large amount of sedimentation near bottom of screen